AN ASSESSMENT OF THE CURRENT IMPACT AND POTENTIAL RISKS OF ACID DEPOSITION

ON SMALLMOUTH BASS POPULATIONS IN ONTARIO

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The Ontario Fisheries Acidification Report Series has been established by the Ontario Ministry of Natural Resources to document findings from studies conducted as part of the Fisheries Acidification Program. These reports are intended to contribute to our knowledge of acidification effects, but they should also be of general interest to fisheries managers.

These reports are basically progress reports. Much of this information will appear later in journal papers.

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ABSTRACT

A set of 743 sampled smallmouth bass lakes was used to classify the known population of 2421 smallmouth bass lakes in Ontario by pH and alkalinity categories. Classification was performed by region, district, and lake size class to reduce the effects of biases identified in the set of sampled lakes. Using data from previous field and laboratory studies, pH categories were defined to reflect the sensitivity of smallmouth bass populations to low pH water: < 5.0, extirpation certain; $5.0-<5.5$, extirpation probable; $5.5-<6.0$, extirpation possible. The percent of the known population of smallmouth bass lakes in Ontario in each pH category was estimated as: 0.2% (N = 6) with pH <5.0; 2.1% (N = 51) with $5.0 \leq$ pH < 5.5; and 6.9% (N = 167) with $5.5 \leq$ pH < 6.0. Most (98.7%, N = 221) of the estimated number of known smallmouth bass lakes with pH <6.0 are located in the Northeastern and Algonquin Regions. Alkalinity was used to classify lakes according to their sensitivity to acid loading. Sensitive smallmouth bass lakes (alkalinity <10 mg/l) located in areas receiving highly acidic deposition (>20 kg of wet sulphate/ha/yr) can experience pH depressions which may threaten inhabiting smallmouth bass populations. These lakes represent an estimated 47.3% (N = 1145) of the known population of smallmouth bass lakes in Ontario.

INTRODUCTION

The smallmouth bass (Micropterus dolomieui) has for many years been a major contributor to the sport fishery in Ontario. Currently, many smallmouth bass lakes are being subjected to high levels of acid loading, due to the widespread acidic deposition that occurs in the province (Tang et al. 1986). The extent to which bass populations are, or will be, affected by this acidic deposition depends on a number of factors. These include the rate of acid loading into smallmouth bass lakes, the susceptibility of smallmouth bass lakes to acidification, and the tolerance of smallmouth bass to low pH and associated changes in water quality.

Often, the effects of acidification on fish populations become evident as abnormal age class compositions, resulting from the absence or near absence of several age classes (Harvey 1982). Ultimately, populations may disappear from acidified lakes. Smallmouth bass are reported to have been lost from twelve lakes in the La Cloche Mountain area of Ontario (Harvey and Lee 1982).

Smallmouth bass reach their northern limit of distribution in Ontario (Scott and Crossman 1973). Extensive introductions in the early 1900s established populations north of the original range of the species (MacLeod 1962). Many of the northern populations exhibit large variations in year class strength which are related to the temperature regime experienced by the bass during their first year of life (Shuter et al. 1980). These populations, already stressed by climatic

conditions, may be highly susceptible to the added stress of acidification and risk extirpation.

In this study, estimates are calculated of the current status of the smallmouth bass resource with respect to acidification, and of the potential risks resulting from continued deposition at current or increased levels. The distribution of known smallmouth bass lakes is examined with respect to current patterns of acidic deposition in the province, and the tolerance of smallmouth bass to acidic water is assessed by reviewing completed field and laboratory studies.

METHODS

Two data sets were used in the analysis. The first consists of a set of 743 smallmouth bass lakes sampled for the water chemistry variables pH, alkalinity, total aluminum, and calcium. The data for the sampled lakes were extracted from the comprehensive data set, a set of chemical, morphological, and species presence data for Ontario lakes maintained by the Fisheries Acidification Program of the Ontario Ministry of Natural Resources (OMNR). The species presence data originated from the Aquatic Habitat Inventory surveys (Dodge et al. 1985). Water chemistry samples were collected between 1978 and 1985. Most are tube composite samples, taken to a depth of at least 5 meters (1 meter from the bottom in shallow lakes). pH was measured with an electronic pH meter; total alkalinity by the gran method; and total aluminum and calcium by atomic absorption (Environment Canada 1979; Ontario Ministry of the Environment 1981). In addition to the water

chemistry data, lake size and location, by OMNR administrative region and district, are recorded.

The second data set consists of all the lakes in Ontario known to contain smallmouth bass (N = 2421) (Ontario Ministry of Natural Resources 1987). This data set was constructed from information provided by OMNR personnel in district offices across the province. Data on lake size and location, by OMNR administrative region and district, are recorded for each lake.

The sampled lakes were used to estimate the number of known smallmouth bass lakes at different levels of acidity, and in different categories of sensitivity. For example, if a certain fraction of the sampled lakes were found to be extremely sensitive to acidification, then it was estimated that the same fraction of known smallmouth bass lakes were extremely sensitive. This scaling up from the sampled lakes to the known population of lakes was done by administrative region and/or district (Fig. 1). The set of sampled lakes is not an unbiased, random subset of the known lakes (see Results and Discussion).As a result, the known populations of smallmouth bass lakes in different regions are not equally represented in the sampled subset. Also, acidic deposition varies across the province (Fig. 2), and can vary from region to region. Scaling up within regions helps ensure that each sample estimate is applied to a known population of lakes receiving similar acidic deposition.

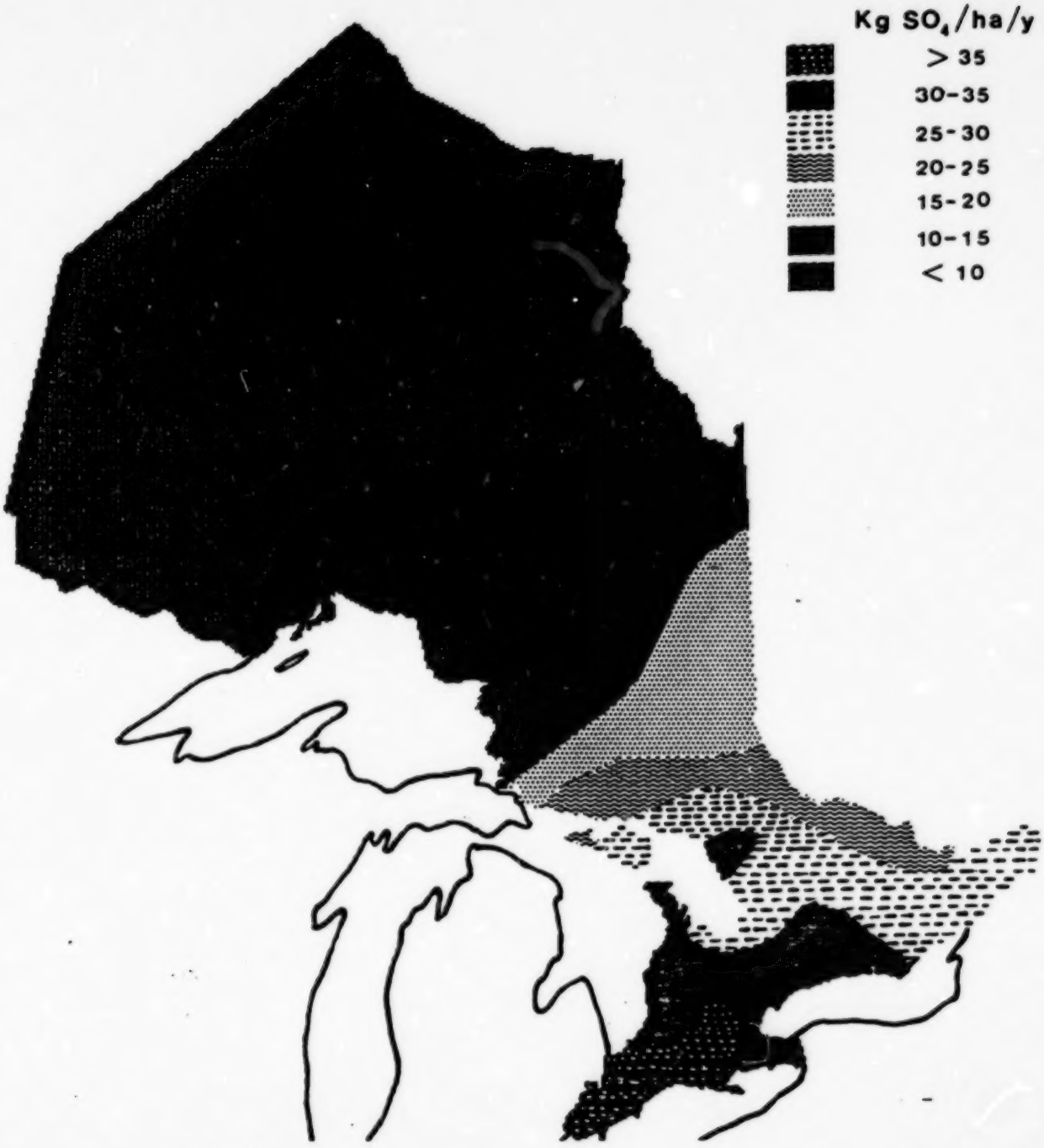
The Northeastern Region was further split into two parts, the Sudbury District and all remaining districts. Lakes in the Sudbury District have been severely impacted by acid loading due to local

FIGURE 1. Administrative regions of Ontario. Also shown are the Wawa and Sudbury districts in the Northeastern region, and the Huronia district in the Central region.

NW = Northwestern
NC = North Central
N = Northern
NE = Northeastern

AL = Algonquin
E = Eastern
C = Central
SW = Southwestern

FIGURE 2. Sulphate wet deposition in Ontario (Tang et al. 1986)



emissions from smelting operations in the city of Sudbury (Keller and Pitblado 1986). Scaling up in the Central Region was done solely for the Huronia District since only this district contains sampled lakes. Lakes in other districts of this region are mainly located on sedimentary rock (Shilts 1981), which has the capacity to buffer acidic deposition and prevent or greatly reduce acidification. No scaling up was done for the Southwestern region since no lakes were sampled there. The region is located on sedimentary rock (Shilts 1981), and the acidification of lakes is assumed to be unlikely.

Scaling up was also attempted by lake size class within each region, since the sampled lakes are biased by size (see Results and Discussion), and low pH lakes tend to be smaller than high pH lakes (Rago and Wiener 1986). Sampled lakes were divided into two lake size classes: 1-100 hectares and 100+ hectares. The scaling up procedure was performed by size class only for the Algonquin Region. In all other regions, the number of lakes in at least one of the size classes was judged too small to warrant classification by chemical status by size class.

RESULTS AND DISCUSSION

DISTRIBUTION OF THE KNOWN POPULATION OF SMALLMOUTH BASS LAKES RELATIVE TO ACIDIC DEPOSITION

The greatest concentration of smallmouth bass lakes in Ontario occurs in the south-central part of the province, roughly between 44°30' and 47°N latitude (Fig. 3), where average wet sulphate deposition ranges from 20 to 35 kg/ha/yr (Fig. 2). This area is underlain by Precambrian bedrock that has little capacity to neutralize acidic solutions (Shilts 1981). Since relatively high numbers of acidic lakes have been found in sensitive areas where sulphate deposition was greater than 15-20 kg/ ha/ yr (Schofield 1982), the smallmouth bass lakes in south-central Ontario appear to be in danger of acidification. Most of these high risk bass lakes are located in two OMNR administrative regions, the Northeastern Region and the Algonquin Region, which together contain 59.1% (N = 1431) of the known population of smallmouth bass lakes in the province (Fig. 4). Almost all of the bass lakes in these two regions are high risk lakes. A portion of the Northeastern Region, Wawa District (Fig. 1), extends northward into an area of reduced sulphate deposition, but only 9 known smallmouth bass lakes are found there.

In the southernmost part of Ontario, wet sulphate deposition is highest, ranging from 25 kg/ha/yr to greater than 35 kg/ha/yr (Fig. 2). However, the underlying rock in this area is carbonate rich and has a large capacity for neutralizing acidic solutions (Shilts 1981). Therefore, it is unlikely that smallmouth bass lakes in this area will

FIGURE 3. Distribution of known smallmouth bass lakes in Ontario (Ontario Ministry of Natural Resources 1987).

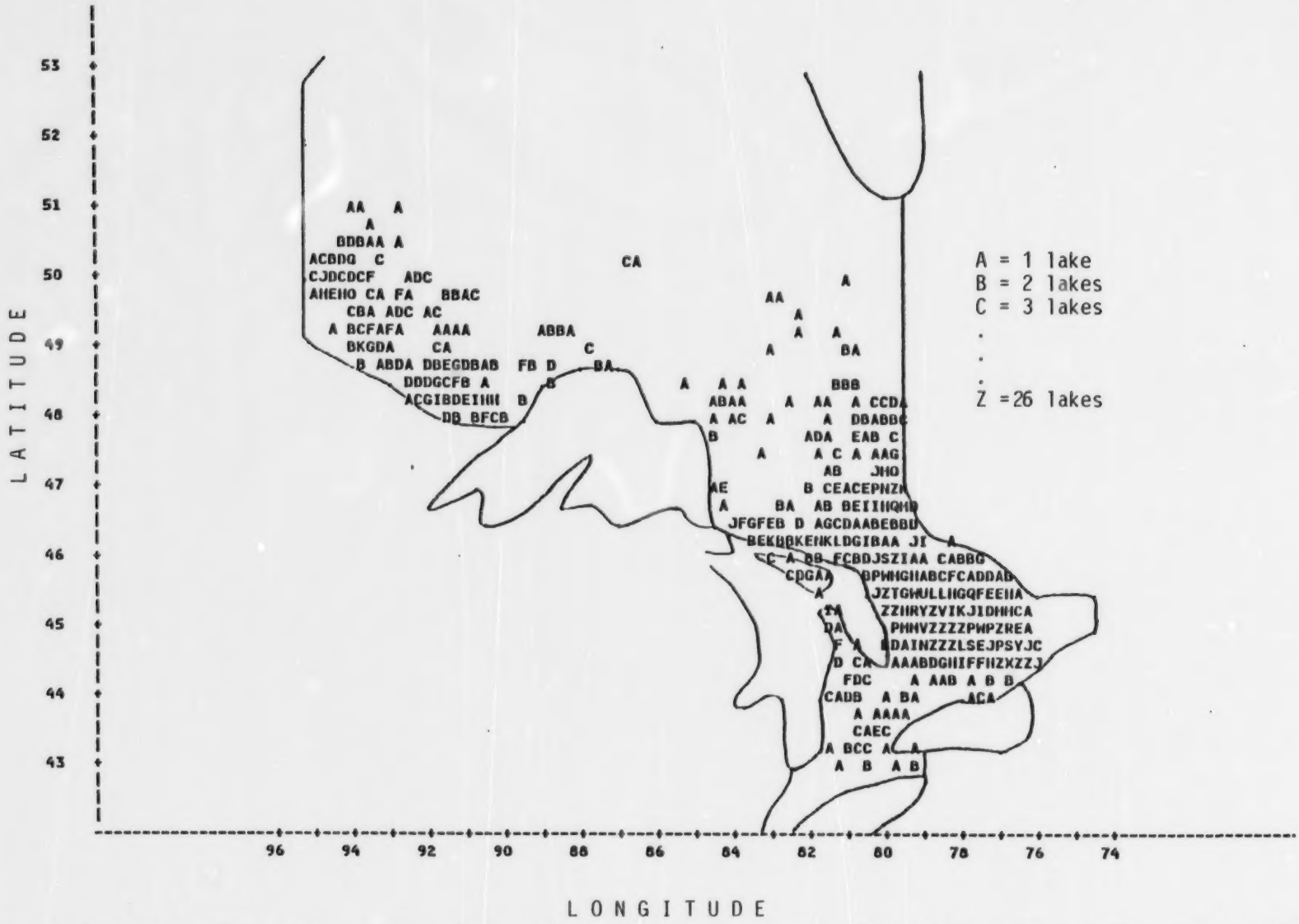
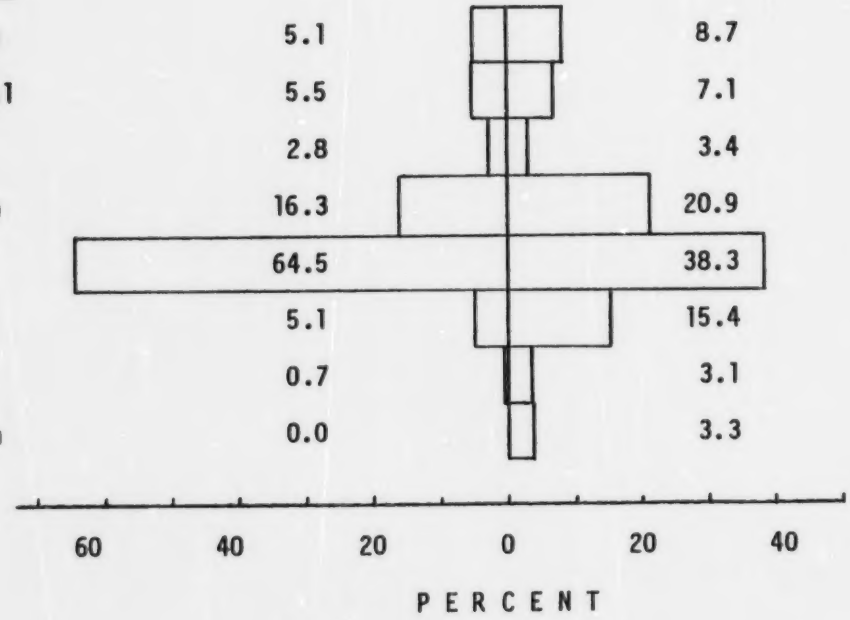


FIGURE 4. Percent of smallmouth bass lakes by administrative region, for the sampled and known data sets.



Region	Sampled lakes	Known lakes	Number sampled	Number known	Percent of known sampled
Northwestern	5.1	8.7	38	210	18.1
North Central	5.5	7.1	41	172	23.8
Northern	2.8	3.4	21	83	25.3
Northeastern	16.3	20.9	121	505	24.0
Algonquin	64.5	38.3	479	926	51.7
Eastern	5.1	15.4	38	372	10.2
Central	0.7	3.1	5	74	6.8
Southwestern	0.0	3.3	0	79	0.0
			743	2421	30.7

become acidified in the near future. These relatively low risk lakes are found in the three most southern OMNR administrative regions, the Eastern, Central, and Southwestern Regions, which together contain 21.7% (N = 525) of the known smallmouth bass lakes in Ontario (Fig. 4).

The distribution of smallmouth bass lakes becomes sparse in northern Ontario, as the northern limit of smallmouth bass is approached (Fig. 3). The most northern smallmouth bass lakes are found at about 51° N latitude. The large northern OMNR administrative regions, the Northwestern, North Central, and Northern Regions, together contain only 19.2% (N = 465) of the known smallmouth bass lakes in Ontario (Fig. 4). Sulphate deposition is relatively low in these regions, ranging from less than 10 kg/ha/yr in the Northwestern Region to 15-20 kg/ha/yr in the Northern Region (Fig. 1 and 2). Therefore, extensive or pronounced acidification of smallmouth bass lakes in the north from acidic deposition is unlikely.

BIASES IN THE SAMPLED SUBSET OF SMALLMOUTH BASS LAKES

The 743 smallmouth bass lakes in the sampled data set represent 30.7% of the 2421 known smallmouth bass lakes in the province. However, the subset does not accurately represent the distribution of known smallmouth bass lakes by administrative region (Fig. 4). The Algonquin Region is by far the most intensively sampled region, with 51.7% of the known smallmouth bass lakes sampled. These 479 lakes represent 64.5% of the sampled subset, whereas only 38.3% of known smallmouth bass lakes are found in this region. In contrast, the three

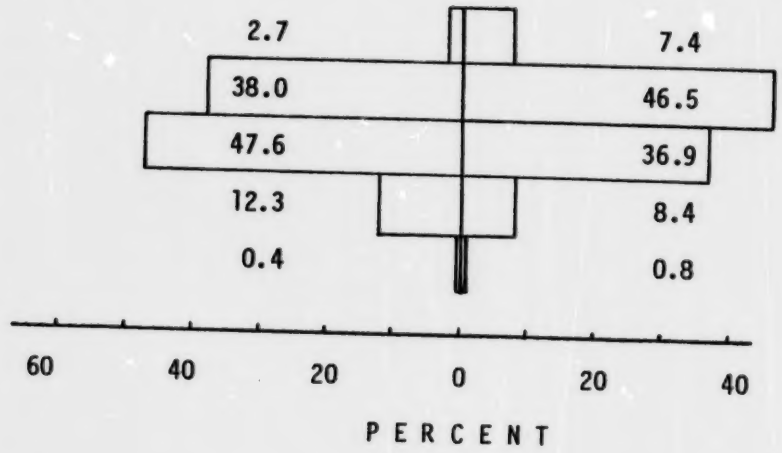
most southern regions, Eastern, Central, and Southwestern, are the most under-represented in the sampled subset, with 10% or less of the known smallmouth bass lakes sampled in each. These three regions contain 21.7% of the known smallmouth bass lakes in the province, but are represented by only 5.8% of the lakes in the sampled subset. The remaining four regions have sampling rates of 18-25% of the number of known smallmouth bass lakes.

The sampled subset also does not accurately represent the distribution of known smallmouth bass lakes by lake size class (Fig. 5). There is a definite bias toward larger lakes. The percent of known lakes sampled increases steadily with size class, from 11.2% for lakes of 1-10 ha to 45.0% for lakes of 1000-10,000 ha. Lakes of 1-100 ha represent 53.9% of the known smallmouth bass lakes, but only 40.6% of the sampled subset; whereas lakes of 100-10,000 ha represent 59.0% of the sampled subset, and only 45.3% of the known population.

SENSITIVITY OF SMALLMOUTH BASS TO ACIDIC WATER

The sensitivity of fish to acidic water varies widely among different fish species, and also varies among different life stages within species (Haines 1981; Baker 1982; Magnuson et al. 1984). Furthermore, the toxicity of acidic water is not only a function of the concentration of hydrogen ions, but varies according to the concentration of other ions. Elevated concentrations of aluminum are often associated with low pH, and generally contribute to the toxicity of acidic water (Baker 1982). However, the degree of aluminum toxicity and the modes of toxic response in fishes vary with the level of pH

FIGURE 5. Percent of smallmouth bass lakes by lake size class, for the sampled and known data sets.



Size class (ha)	Number sampled	Number known	Percent of known sampled
1-10	20	178	11.2
10-100	282	1123	25.1
100-1000	347	891	38.9
1000-10,000	91	202	45.0
10,000+	3	19	15.8
	743	2413	30.8

(Baker 1982). The presence of high concentrations of calcium in acidic water is known to counteract the harmful effects of low pH and elevated aluminum (Wright and Snekvik 1978; Leivestad 1982; Wood and McDonald 1982).

A number of researchers have examined the status of smallmouth bass populations in acidic lakes. Beamish (1976) found that smallmouth bass populations in the La Cloche Mountain area of Ontario experienced reproductive failure at pH levels between 5.5 and 6.0. In the Adirondack region of New York (U.S.A.), smallmouth bass populations have been lost from lakes with pH values of 5.9 (Canada Lake) and 5.7 (Woodhall Lake) (Pfeiffer and Festa 1980). In a study of naturally acidic Wisconsin (U.S.A.) lakes, Rahel and Magnuson (1983) found that smallmouth bass were absent from lakes with summer pH values less than 5.6. However, Wiener et al. (1984) have described an apparently viable population of smallmouth bass in a Wisconsin lake (Lumen Lake) with a summer pH of 5.5 (autumnal pH of 5.2). Total lengths from a sample of this population, caught during the summer, ranged from 96 to 228 mm, indicating recent successful recruitment. After surveying acidified lakes in the La Cloche Mountain area of Ontario, Harvey (1979) reported the existence of apparently unaffected smallmouth bass populations in lakes with pH values down to 5.0. These populations appeared unaffected by acid stress judging by their age class structures and growth patterns. However, Harvey acknowledged that his tolerance limits may be too low, arguing that since the lakes were surveyed at the end of a period of heavy acid loading from the Sudbury smelters, the fish populations may still have been in the process of responding

to the acid stress.

Smallmouth bass have spawned successfully in Sans Chambre Lake (46°43'N 81°09'W), near Sudbury, at a pH of 5.3 (J. Gunn, OMNR, pers. comm.). After the lake was stocked with forty adult bass in August, 1980, one nest was found the following June with a large cloud of emerging fry above it. The pH of lake water was 5.3 in early May. Total aluminum in the lake varied between 98 and 140 µg/l during the year. Young bass were observed in the lake the following year (1982) (V. Liimatainen, OMNR, pers. comm.), indicating that young-of-the-year bass had survived the previous winter at pH 5.6 (B. Keller, Ontario Ministry of the Environment (OMOE), pers. comm.). By 1983, pH ranged from 5.7 to 5.9 (May-Oct.) and total aluminum ranged from 38 to 87 µg/l (May-Oct.) (B. Keller, pers. comm.). Another survey, conducted in 1984, confirmed that a reproducing population of bass had been established in the lake (V. Liimatainen, pers. comm.)

Four-day bioassays have been conducted with three week old bass fry at sites in the La Cloche Mountain area of Ontario. Mortality was 100% at two sites with pH values of 4.6 and 4.7, 9.3% at one site with pH at 5.2, and less than 3% at four sites with pH values of 5.6, 6.0, 6.1, and 6.1 (J. Gunn, pers. comm.). Inorganic aluminum was greater than 270 µg/l at sites with pH values less than 5.0, and less than 50 µg/l at sites with pH values greater than 5.0.

In situ bioassays have been used to estimate the mortality rates of overwintering young-of-the-year smallmouth bass in acidic waters (E. Snucins, Trent University, pers. comm.). Sites were located in the La Cloche Mountain area of Ontario. Mortality was 100% in four

lakes with pH values ranging from 4.9 to 5.8: Acid Lake - pH 4.9, total aluminum 255 µg/l; Partridge Lake - pH 5.2, total aluminum 135 µg/l; Terry Lake - pH 5.5, total aluminum 180 µg/l; and George Lake - pH 5.8, total aluminum 59 µg/l. Calcium concentrations ranged from 2.0 to 3.2 mg/l.

A number of laboratory experiments have been performed to assess the sensitivity of different life stages of smallmouth bass to acidic water. Experiments with bass eggs have shown that hatching success is greater than 90% in water with pH values greater than or equal to 4.5 (K. Holtze, OMOE, pers. comm.). However, fry appear to be more sensitive than eggs. In experiments in which fry were exposed to acidic water for seven days post hatch, the survival rate was less than 1% at pH 4.8, with no aluminum present (K. Holze, OMOE, pers. comm.). The survival rate increased to greater than 94% at pH 5.1, with inorganic monomeric aluminum concentrations ranging from 0 to 100 µg/l. The concentration of calcium was kept at 4 mg/l. Based on experiments with young-of-the-year bass, B. Shuter (OMNR, pers. comm.) has estimated an overwintering mortality rate of 50% at pH 4.9 and a calcium concentration of 3.5 mg/l. The laboratory experiments performed to date suggest a greater tolerance of smallmouth bass to acidic water than that indicated by field observations. This type of discrepancy has also been found in studies of other fish species (Haines 1981), and is possibly due to the omission in the laboratory of additional stresses that occur in the field.

Judging from the above data, reproducing populations of smallmouth bass cannot exist in water with pH values less than 5.0. At

pH values between 5.0 and 5.5 the risk of extirpation is high. Between pH 5.5 and 6.0 the risk appears to be lower. No distinct threshold for extirpation can be determined from the current data. Future studies may lead to the establishment of a relatively precise pH threshold; or else, the threshold for extirpation may be shown to vary over a relatively wide range among lakes, according to the different abiotic and biotic conditions experienced by individual smallmouth bass populations. Populations that are severely stressed by factors unrelated to pH may be endangered at higher pH values than populations that exist under more favourable conditions.

CURRENT ACIDITY OF SMALLMOUTH BASS LAKES

An estimated 0.2% (N = 6) of the known population of smallmouth bass lakes have pH levels sufficiently low (< 5.0) to cause the extirpation of inhabiting bass populations (Table 1). All these lakes are located in the Northeastern and Algonquin Regions, an area of high sulphate deposition that is geologically sensitive to acidic precipitation. An estimated 2.1% (n = 51) of the known population of smallmouth bass lakes have pH levels (5.0-<5.5) that seriously threaten the continued survival of inhabiting bass populations. All these lakes are also located in the Northeastern and Algonquin Regions. An additional 6.9% (N = 167) of known smallmouth bass lakes are estimated to have pH values between 5.5 and 6.0. The risk to bass populations in these lakes is lower, and may be limited to situations where the inhabiting populations are exposed to additional stresses. Ninety-eight point two per cent (98.2%) of these lakes are located in the

TABLE 1. Estimated number of smallmouth bass lakes in each pH category.

Region	Number of Sampled Lakes	Percent of sampled lakes by pH category			Number of Known Lakes	Number of known lakes by pH category		
		<5.0	5.0-<5.5	5.5-<6.0		<5.0	5.0-<5.5	5.5-<6.0
Northwestern	38	0	0	0	210	0	0	0
North Central	41	0	0	0	172	0	0	0
Northern	19	0	0	0	83	0	0	0
Northeastern								
Sudbury District	27	3.7	14.8	25.9	101	4	15	26
Other districts	92	0	0	5.4	404	0	0	22
Algonquin								
1-100 ha	252	0.4	4.8	14.3	617	2	30	88
100+ ha	224	0	1.8	8.9	309	0	6	28
Eastern	38	0	0	0	372	0	0	0
Central								
Huronia District	5	0	0	20.0	16	0	0	3
Other districts	0	0	0	0	58	0	0	0
Southwestern	0	0	0	0	79	0	0	0
			Provincial Total		2421	6	51	167
		Percent of all known lakes				0.2%	2.1%	6.9%

Northeastern and Algonquin Regions.

Smallmouth bass lakes with pH < 6.0 (N = 224) are almost exclusively (98.7%) located in two administrative regions of Ontario, the Northeastern and Algonquin Regions. Within the Northeastern Region, smallmouth bass lakes with pH < 5.5 (N = 19) are located solely within the Sudbury District, near the large sources of SO_2 emissions in Sudbury (Keller & Pitblado 1986). Within the Algonquin Region, smallmouth bass lakes with pH < 6.0 comprise an estimated 19.4% (N = 120) of the known population of small (1-100 ha) bass lakes, compared with only 11.0% (N = 34) of the known population of large (100+ ha) bass lakes. Smallmouth bass lakes less than 100 ha appear more likely to exhibit low pH levels than larger lakes. This supports the general tendency for low-pH lakes to be smaller than high-pH lakes (Rago and Wiener 1986).

Minns (1986) has also estimated the number of acidic smallmouth bass lakes in Ontario as part of a broader analysis involving all the lakes in Ontario. Procedures were used to correct for observed biases in the sampled set of lakes, but did not include the use of the smallmouth bass atlas as was done in this study. Minns estimated that there are 6 smallmouth bass lakes in Ontario with pH < 5.0, equal to the estimate produced in this analysis; but he estimated 108 bass lakes with pH values of 5.0-<5.5, compared with 51 lakes estimated in this analysis. However, he worked with a provincial estimate of 3500 smallmouth bass lakes, compared with the provincial estimate of 2421 lakes used in this study. If his values are adjusted by the fraction 2421/3500, the results of the two analyses are in better agreement:

4 lakes with pH values <5.0 compared with 6 lakes estimated in this study; and 75 lakes with pH values of 5.0-<5.5, compared with 51 lakes estimated in this study.

Total aluminum was measured for 15 smallmouth bass lakes with pH values between 5.0 and 5.5, and ranged from 12 µg/l to 160 µg/l (median = 110 µg/l). However, very little data is available to assess the effects of total aluminum concentration on the survival of smallmouth bass in acidic water. Based on the successful spawning in Sans Chambre Lake at total aluminum concentrations in the range of 98-140 µg/l (see above), the observed total aluminum concentrations do not appear to seriously affect bass eggs or fry. The presence of complexing organic ligands must also be considered in the evaluation of the toxicity of total aluminum concentrations (Baker 1982).

The concentration of calcium was measured for 16 smallmouth bass lakes with pH values between 5.0 and 5.5: 25% had values between 1 and 2 mg/l, 62.5% between 2 and 3 mg/l, and 12.5% between 3 and 5 mg/l. Wright and Snekvik (1978) found that calcium concentrations in the range of 0-4 mg/l were important in determining the fish status (barren, sparse, or good) of acidified Norwegian lakes.

A listing of all the sampled smallmouth bass lakes in Ontario, with their water chemistry data, forms Appendix I of this report. Lakes with bass populations that risk extirpation are highlighted according to their level of risk.

SENSITIVITY OF SMALLMOUTH BASS LAKES TO ACIDIC DEPOSITION

In this study, the sensitivity of smallmouth bass lakes to acid loading is measured by alkalinity. The alkalinity of a sample of lake water is a measure of the capacity of the water to neutralize acid (MOE 1982). Smallmouth bass lakes are categorized according to the following classification system, used by the members of the U.S.-Canada Aquatic Impacts Assessment Subgroup (United States-Canada 1981) and the Limnology and Toxicity Section of the Ontario Ministry of the Environment (Ontario Ministry of the Environment 1982):

CATEGORY	ALKALINITY (mg/l)
acidified	≤ 0
extremely sensitive	$>0 - <2$
moderately sensitive	$2 - <10$

Lakes with alkalinity values below 10 mg/l have a significant potential to be affected by acidic deposition, whereas lakes above 10 mg/l are unlikely to be affected in the near future (United States-Canada 1981; Ontario Ministry of the Environment 1982). Furthermore, sensitive lakes with lower alkalinity values are more likely to experience episodic pH depressions (e.g. due to snow melt) than lakes with higher alkalinity values, and the depressions that occur are likely to be of larger magnitude (Ontario Ministry of the Environment 1982; United States-Canada 1983).

The estimated fractions of the known population of smallmouth bass lakes in each sensitivity category are: 0.8% (N = 19) acidified; 11.4% (N = 277) extremely sensitive; and 41.3% (N = 1001) moderately

sensitive (Table 2). All of the acidified lakes are located in the Northeastern and Algonquin Regions, an area of high sulphate deposition that is geologically sensitive to acidic deposition. Ninety-eight point two per cent (98.2%) (N = 272) of the extremely sensitive lakes, and 76.4% (N = 765) of the moderately sensitive lakes are also located in these two regions.

Within the Sudbury District an estimated 88.1% (N = 89) of the known population of smallmouth bass lakes are acidified or sensitive to acidic deposition: 11.9% (N = 12) acidified; 53.5% (N = 54) extremely sensitive; and 22.8% (N = 23) moderately sensitive. Sudbury has been a large source of SO_2 emissions for many years, and has had a significant impact on the surrounding lakes (Keller and Pitblado 1986).

A tendency for smaller smallmouth bass lakes to be more sensitive than larger bass lakes is evident in the Algonquin Region. An estimated 21.9% (N = 135) of the known population of small (1-100 ha) smallmouth bass lakes are acidified or extremely sensitive in this region, compared with 13.6% (N = 42) of the large (100+ ha) smallmouth bass lakes.

Minns (1986) has estimated that 26 smallmouth bass lakes in Ontario have alkalinities <0 mg/l; 644 lakes have alkalinities of 0-$<$2.5 mg/l; and 1612 lakes have alkalinities of 2.5-$<$10 mg/l. If his estimates are adjusted by the fraction 2421/3500 (see previous section), then the results of the two analyses are in better agreement: 18 lakes with alkalinities <0 mg/l, compared with 19 lakes with alkalinities ≤ 0 mg/l estimated in this study; 445 lakes with alkalinities of 0-$<$2.5 mg/l, compared with 277 lakes with alkalinities

TABLE 2. Estimated number of smallmouth bass lakes in each sensitivity category.

Region	Number of Sampled Lakes	Percent of sampled lakes by sensitivity category			Number of Known Lakes	Number of known lakes by sensitivity category		
		acidified	extremely sensitive	moderately sensitive		acidified	exteremly sensitive	moderately sensitive
Northwestern	38	0.0	0.0	18.4	210	0	0	39
North Central	40	0.0	0.0	52.5	172	0	0	90
Northern	18	0.0	5.6	22.2	83	0	5	18
Northeastern								
Sudbury District	26	11.5	53.9	23.1	101	12	54	23
Other districts	91	1.1	11.0	61.5	404	4	44	248
Algonquin								
1-100 ha	248	0.0	21.8	48.8	617	0	135	301
100+ ha	215	0.9	12.6	62.3	309	3	39	193
Eastern	27	0.0	0.0	22.2	372	0	0	83
Central								
Huronia District	5	0.0	0.0	40.0	16	0	0	6
Other districts	0	0.0	0.0	0.0	58	0	0	0
Southwestern	0	0.0	0.0	0.0	79	0	0	0
			Provincial Total		2421	19	277	1001
			Percent of all known lakes			0.8%	11.4%	41.3%

of >0-<2.0 mg/l estimated in this study; and 1115 lakes with alkalinities of 2.5-<10.0 mg/l, compared with 1001 lakes with alkalinities of 2.0-<10.0 mg/l estimated in this study.

An estimated 47.3% (N = 1145) of the known population of smallmouth bass lakes have alkalinities less than 10 mg/l, and are located in areas of high sulphate deposition (>20 kg/ha/yr). These lakes may experience episodic pH depressions during spring melt similar to those described by Jefferies et al. (1979), and Gunn and Keller (1986). However, there is little risk to smallmouth bass eggs or fry since smallmouth bass spawn most often in late May to early June (Scott and Crossman 1973), and the spring pH depressions associated with snowmelt generally occur before this period (Jefferies et al. 1979; Gunn and Keller 1986).

Nevertheless, springtime pH depressions may influence smallmouth bass populations by affecting a different stage in the life cycle. Near the northern limit of the distribution of smallmouth bass, young-of-the-year bass are often in an advanced state of starvation by the end of the winter since they do not feed at low temperatures and must survive on stored energy reserves (Shuter et al. 1980). In the spring they are found in shallow nearshore areas (J. MacLean, OMNR, pers. comm.), where they risk exposure to potentially toxic low pH meltwater. Furthermore, their ability to avoid this toxic water seems to be limited (J. MacLean, pers. comm.). In the laboratory, Kwain et al. (1984) found that young-of-the-year smallmouth bass become more sensitive to acidity during the course of a prolonged starvation period of up to six months. They noted that near the end of this period of

starvation the laboratory pH threshold for short term (4 days) 50% mortality approached levels observed in Ontario lakes.

During a particularly unfavourable year, young-of-the-year bass may experience a cool short summer followed by a long winter, resulting in poor summer growth, low energy reserves entering the winter, and increased levels of starvation during the winter. Heavy, prolonged spring runoff at low pH may be the final stress that reduces or completely eliminates an already poor year class. Over a period of years, the effects of acidification may show up as an increased frequency of very poor or missing year classes.

CONCLUSION

A relatively small fraction (2.4%, N = 57) of the population of smallmouth bass lakes in Ontario are estimated to currently have pH values that are likely to eliminate existing smallmouth bass populations (i.e. with pH <5.5). However, the potential damage to the provincial smallmouth bass resource is much greater. An estimated 47.3% (N = 1145) of the population of smallmouth bass lakes are sensitive to acid loading (alkalinities <10 mg/l), and are located in areas receiving highly acidic deposition (>20 kg of wet sulphate/ha/yr). The survival of self-reproducing smallmouth bass populations in these lakes is uncertain if acidic deposition continues at current levels or increases.

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Appendix I

Listing of sampled smallmouth bass lakes in Ontario, sorted by lakename within administrative region. Data fields include: latitude (LAT), longitude (LONG), district number, lake area, year and month lake sampled, pH, risk of extirpation (RISK), alkalinity (ALK), total aluminum (AL), and calcium (CA). Risk of extirpation is based on pH categories:

*** indicates pH < 5.0 and extirpation is certain;

** indicates $5.0 \leq pH < 5.5$ and extirpation is probable; and

* indicates $5.5 \leq pH < 6.0$ and extirpation is possible.

Missing values are indicated by a period, '.'. An alkalinity value of -99.99 indicates an actual value below the detection limit.

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=NORTHWESTERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
ABRAM LAKE	5004	9157	16	2397.6	78	8	7.39		18.90	.	.
ANDY LAKE	4938	9404	14	163.0	78	8	7.40		24.70	.	.
ARMSTRONG LAKE	4958	9423	14	147.0	81	5	7.08		9.83	0.001	3.0
BALNE LAKE	4950	9409	14	41.0	81	5	6.79		8.39	0.071	3.0
BEAUTY LAKE	5017	9414	14	319.0	80	6	7.04		17.50	0.022	5.0
BIG CANYON LAKE	5005	9346	14	2111.0	80	6	7.33		17.60	0.026	6.0
BLINDFOLD LAKE	4940	9415	14	496.5	78	8	6.89		8.60	.	.
BURDITT LAKE	4857	9346	12	1421.6	81	7	7.48		41.60	.	14.0
BUTTERFLY LAKE	4959	9205	16	136.1	78	8	7.61		43.00	.	.
CATASTROPHE LAKE	4954	9447	14	287.6	78	8	6.80		6.65	.	.
CATHERINE LAKE	4951	9448	14	87.9	78	8	6.59		7.40	.	.
CEDAR LAKE	5009	9308	11	2990.0	80	8	7.98		44.37	.	13.0
CLIFF LAKE	5010	9318	11	2544.0	80	8	7.67		35.53	.	6.0
COBBLE LAKE	4953	9337	11	1181.8	81	7	7.24		18.36	.	6.0
CYGNET LAKE	5000	9453	14	1355.6	81	7	7.25		16.55	.	5.0
DELANEY LAKE	5005	9403	14	1303.0	80	6	7.46		13.83	0.026	4.0
DINORMIC LAKE	4937	9233	11	5169.1	78	8	7.58		12.90	.	.
DUMPY LAKE	5019	9404	14	352.0	80	6	7.09		17.69	0.033	6.0
EAGLE LAKE	4942	9313	11	27712.9	78	8	7.21		14.45	.	.
ENCAMP LAKE	4916	9106	13	475.0	80	9	7.53		21.10	0.008	7.0
GRANITE LAKE	4942	9451	14	141.8	78	8	7.11		10.95	.	.
INDIAN LAKE	4934	9140	13	3965.8	81	7	7.48		21.79	.	7.0
KAKAGI LAKE	4913	9352	14	11194.4	78	8	8.15		51.00	.	.
KILVERT LAKE	4942	9402	14	974.0	81	5	7.09		9.53	0.015	3.0
LOUNT LAKE	5010	9419	14	3014.4	81	6	7.74		37.80	.	12.0
MALACHI LAKE	4953	9500	14	1084.6	81	7	7.18		12.75	.	4.0
OFF LAKE	4854	9349	12	459.3	78	8	7.70		44.05	.	.
PELICAN LAKE	5007	9158	16	2343.3	81	7	7.56		25.77	.	9.0
PERRAULT LAKE	5018	9308	11	3312.9	80	8	8.29		56.30	.	.
RED DEER LAKE	5001	9410	14	458.0	80	6	7.49		10.87	0.009	4.0
SAND LAKE	5005	9439	14	7965.2	81	6	7.59		48.60	.	14.0
SCOTTY LAKE	5021	9404	14	749.0	80	6	7.17		14.83	0.014	4.0
THUNDER LAKE	4947	9240	11	1123.8	78	8	7.69		32.50	.	.
TIDE LAKE	5020	9358	14	1351.2	81	6	7.59		48.60	.	12.0
TROUT LAKE	4947	9408	14	314.0	81	5	6.87		6.39	0.010	3.0
UPPER MANITOU LAKE	4924	9248	11	5154.1	80	8	8.13		36.20	.	.
WABIGOON LAKE	4944	9244	11	9930.6	78	8	7.81		35.00	.	.
WORTH LAKE	5000	9446	14	20.0	80	6	7.45		12.97	0.001	4.0

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=NORTH CENTRAL

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
AGNES LAKE	4815	9120	21	3302.0	82	10	6.92		5.80	0.020	2.6
ARROW LAKE	4809	9016	25	3316.9	80	8	7.90		32.60	.	.
BALLARD LAKE	4818	9149	21	112.6	78	7	6.62		4.47	.	.
BANNING LAKE	4845	9158	21	254.5	78	8	6.83		13.10	.	.
BART LAKE	4812	9141	21	164.0	81	5	6.96		5.51	0.021	3.0
BASS LAKE	4839	8844	25	54.5	80	8	8.10		48.90	.	.
BEARPELT LAKE	4829	9202	21	223.6	81	9	7.01		9.37	0.045	2.0
BEAVERHOUSE LAKE	4833	9206	21	2010.0	82	10	6.91		6.24	0.040	2.4
BLACK STURGEON LAKE	4920	8853	23	5062.5	81	6	7.04		31.60	.	.
BREWER LAKE	4817	9158	21	102.1	78	7	7.02		15.40	.	.
CALM LAKE	4846	9204	21	2482.8	78	3	7.10		13.35	.	.
CLOUD LAKE	4808	8932	25	421.2	81	7	6.88		20.80	.	.
CROOKED LAKE	4812	9149	21	3216.3	81	5	7.38		15.75	.	.
DARKY LAKE	4818	9147	21	498.2	78	7	6.61		4.12	.	.
DOG LAKE	4846	8932	25	6613.5	78	8	7.41		11.95	.	.
EVA LAKE	4843	9110	21	1709.1	78	7	6.82		8.35	.	.
FRENCH LAKE	4840	9109	21	340.0	80	2	6.71		7.86	0.037	3.0
KOSS LAKE	4819	9033	25	373.0	80	10	6.82		8.28	0.079	7.0
LITTLE ATHELSTANE LAKE	4845	9015	25	225.2	78	8	7.43		13.75	.	.
LITTLE DOG LAKE	4839	8936	25	91.8	79	8	7.40		21.90	.	.
LITTLE GULL LAKE	4905	9136	21	351.0	82	10	6.75		5.54	0.020	2.2
LITTLE MCCAULAY LAKE	4844	9154	21	81.8	78	7	6.94		13.40	.	.
MIDDLE ROLAND LAKE	4815	9151	21	64.0	78	7	6.69		5.40	.	.
MINN LAKE	4821	9153	21	506.0	81	9	6.69		4.34	0.045	2.0
MOWE LAKE	4819	9045	25	633.0	80	10	7.23		12.28	0.027	6.0
NELSON LAKE	4827	9032	25	665.0	81	5	7.03		9.06	.	.
NIODE LAKE	4843	9120	21	396.0	82	10	6.82		8.12	0.010	3.9
NORTH LAKE	4807	9032	25	1047.0	80	10	7.66		38.18	0.007	14.0
NORTHERN LIGHT LAKE	4816	9039	25	6620.0	80	9	6.95		9.40	0.046	5.0
OLIVER LAKE	4816	8935	25	240.0	79	7	6.80		.	.	6.0
PICKEREL LAKE	4837	9119	21	6510.0	82	10	6.85		6.53	0.010	2.8
POND LAKE	4818	9154	21	86.0	81	11	6.44		4.69	.	2.0
QUETICO LAKE	4834	9155	21	4264.7	78	7	6.85		6.20	.	.
ROBINSON LAKE	4811	9139	21	427.0	82	10	6.71		4.00	0.020	1.6
ROSS LAKE	4822	9056	25	318.0	81	11	6.73		7.34	.	4.0
SANDSTONE LAKE	4814	9014	25	935.2	79	8	7.40		27.10	.	.
SILVER LAKE	4838	8843	25	100.0	80	3	7.64		66.53	0.024	18.0
SNOW LAKE	4850	9133	21	36.4	78	7	7.34		24.40	.	.
STURGEON LAKE	4829	9138	21	4670.0	82	10	7.02		10.46	0.090	4.6
THOMPSON LAKE	4823	9216	21	954.8	81	7	6.88		10.20	.	.
WICKSTEED LAKE	4819	9150	21	603.5	78	7	6.58		5.10	.	.

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=NORTHERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
BEAR LAKE	4807	7938	36	116.8	81	8	7.70		18.00	.	.
BEAVERHOUSE LAKE	4811	7944	36	226.9	81	7	7.64		18.90	.	.
BERNICE LAKE	4733	8151	33	32.4	80	5	6.65		10.30	.	.
ELEPHANT HEAD LAKE	4735	8122	33	109.1	84	2	7.79		42.39	0.013	14.6
FIRTH LAKE	4740	8052	36	433.8	78	10	7.27		13.55	.	.
HOWARD LAKE	4814	7949	36	126.5	82	5	.		.	.	7.2
ISLAND LAKE (NL)	4833	8052	38	9.4	82	7	7.82		51.35	0.100	15.8
KATHLEEN LAKE	4759	8355	31	517.0	85	2	7.26		21.49	0.019	8.1
KUSHOG LAKE (LONG)	4755	8015	36	743.0	82	5	.		.	.	13.9
LEAST LAKE	4736	8313	31	43.5	78	6	6.80		1.15	.	.
LITTLE ISLAND LAKE	4758	8338	31	122.0	85	2	7.17		34.30	0.016	12.5
LOST LAKE	4741	8040	36	76.1	78	10	7.53		40.50	.	.
LOST LAKE	4743	8147	33	54.5	84	2	6.95		5.24	.	3.4
MIDDLETON LAKE	4759	8030	36	55.9	81	8	7.20		9.60	.	.
MISEMA LAKE	4813	7945	36	347.9	82	7	7.29		19.07	0.091	7.8
RAVEN LAKE	4803	7933	36	616.7	85	6	7.42		.	0.150	6.2
SESEKINIKA LAKE	4811	8014	36	589.7	78	10	7.33		21.45	.	.
SISSENEY LAKE	4752	8040	36	366.1	81	8	7.00		9.80	.	.
SKELETONPUP LAKE	4752	7941	36	11.3	81	7	7.22		19.30	.	.
ST. LOUIS LAKE	4739	8148	33	79.8	84	2	6.80		4.84	0.120	4.3
WENDIGO LAKE	4752	7943	36	419.6	80	6	6.75		18.40	.	.

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=NORTHEASTERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
A.Y.JACKSON LAKE	4601	8124	45	6.1	78	5	6.50		0.03	.	.
ACHIGAN LAKE (BASS)	4655	8412	44	274.6	85	2	6.56		2.47	0.085	3.2
AGAWA STATION LAKE	4739	8432	47	66.5	85	2	7.16		6.96	0.006	3.6
ANIMA NIPISSING LAKE	4714	7957	46	2051.2	81	7	6.91		3.62	0.007	3.6
ARTHURS LAKE (JACK'S)	4556	7950	43	215.4	82	5	6.39		5.40	.	4.0
BAY LAKE	4721	7951	46	1456.4	79	5	7.03		13.45	.	.
BEAR LAKE	4612	8127	42	683.1	81	7	6.98		6.69	0.010	6.0
BEARHEAD LAKE	4618	8258	41	267.0	78	7	6.92		3.82	.	.
BEATTY LAKE (WOLFE)	4602	7932	43	121.3	79	5	6.53		4.67	.	.
BELANGER LAKE	4650	7950	46	81.6	79	6	6.60		6.20	.	.
BELL LAKE	4608	8112	45	353.0	81	7	5.37	**	0.04	0.098	3.0
BOLAND LAKE	4645	7926	43	106.5	85	2	7.44		19.21	0.000	7.4
BOYCE LAKE	4650	7938	46	270.5	79	7	7.00		10.60	.	.
CARIBOU LAKE	4622	8350	44	213.8	78	8	6.98		7.95	.	.
CARLYLE LAKE	4604	8117	45	137.0	82	10	5.73	*	0.10	0.045	2.2
CHANT PLAIN LAKE	4619	7846	43	256.0	82	5	6.92		6.76	.	3.9
CHIBLOW LAKE	4621	8303	41	2089.4	81	6	6.89		3.72	0.010	2.6
CLEARWATER LAKE	4702	8018	46	118.7	81	7	6.74		2.13	0.030	4.2
COMMANDA LAKE	4601	7943	43	549.3	78	7	6.63		4.41	.	.
CONSTANCE LAKE	4626	8314	41	113.4	81	2	6.80		7.40	.	.
DEER LAKE	4628	8013	43	277.9	81	6	7.21		15.74	0.074	6.0
DESBARATS LAKE	4623	8356	44	357.2	81	6	6.77		2.50	.	.
DIAMOND LAKE	4625	8355	44	152.3	78	7	6.70		5.80	.	.
DIAMOND LAKE	4712	8015	46	926.0	81	7	6.26		1.28	0.035	2.8
DOG LAKE	4817	8408	47	5184.0	85	2	7.45		32.50	0.009	12.8
DUNLOP LAKE	4629	8242	41	1099.0	79	9	6.88		4.43	.	.
DYMOND LAKE	4643	7918	43	137.3	85	2	6.51		3.01	0.033	3.2
ECHO LAKE	4634	8359	44	1150.2	81	6	6.92		3.70	.	.
ELIZABETH LAKE	4615	8138	42	122.2	81	7	6.98		18.32	0.020	8.0
FAIRBANK LAKE	4628	8126	45	703.1	81	6	7.47		11.44	0.002	7.0
FORLISE LAKE	4652	7935	46	56.9	79	7	6.90		8.10	.	.
GENEVA LAKE	4646	8133	45	356.4	81	6	6.62		2.66	0.023	3.4
GORDON LAKE (NL)	4625	8350	44	560.1	78	8	6.92		18.00	.	.
GREAT MOUNTAIN LAKE	4609	8122	45	191.7	85	2	4.96	***	-99.99	0.131	2.0
GULL LAKE	4654	8012	46	1313.8	81	7	6.99		4.76	0.008	4.8
HALLECK LAKE	4657	8032	45	89.1	79	7	6.70		2.80	.	.
HAMMELL LAKE (CLEAR)	4639	7934	43	140.5	85	2	5.62	*	0.16	0.045	2.2
HARVEY LAKE	4650	8026	45	48.2	79	8	5.50	*	0.20	.	.
HAWK LAKE	4654	8414	44	34.8	85	2	6.48		2.22	0.053	2.6
HELE LAKE (HELENS)	4607	8134	42	68.4	81	7	6.62		3.39	0.010	3.4
HELEN LAKE	4700	8107	45	342.0	81	7	5.88	*	1.04	0.036	2.8
IRON LAKE	4630	8356	44	217.9	81	6	7.05		5.90	.	.
IROQUOIS BAY	4606	8138	42	496.2	80	9	7.30		25.30	.	.
JOBAMMAGEESHIG LAKE	4631	8324	41	546.1	80	8	6.80		5.00	.	.
JOHNSON LAKE	4716	7945	46	38.2	79	6	7.10		9.60	.	.
JOSEPHINE LAKE	4658	8032	45	85.3	79	7	6.65		3.40	.	.
JUMPING CARIBOO LAKE	4653	7947	46	409.1	81	7	6.97		8.76	0.019	5.4
KAKAKISE LAKE	4604	8120	45	118.9	80	3	5.60	*	0.52	.	.
KAKAKIWAGANDA LAKE	4611	8047	45	187.9	81	7	6.63		9.93	0.062	5.2
KASAKAWANIA LAKE	4653	8125	45	96.6	79	9	6.57		5.10	.	.
KEARNS LAKE	4650	8027	45	16.1	79	8	5.10	**	-0.40	.	.
KETTLE LAKE	4652	7945	46	16.4	79	7	6.95		7.00	.	.
KOKO LAKE	4631	7911	43	142.7	85	2	6.43		2.91	0.210	3.3

REGION=NORTHEASTERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
LA CHAPELLE LAKE	4617	7907	43	22.3	80	7	6.55		13.50	.	.
LAKE NOSBONSING	4612	7913	43	1705.9	80	7	7.00		13.60	.	.
LAKE TEMAGAMI	4700	8005	46	20979.0	81	7	7.20		9.40	0.016	6.4
LAKE 4 (NL)	4702	8009	46	56.7	79	8	6.00		1.50	.	.
LANG LAKE	4610	8140	42	596.4	82	5	7.23		7.62	.	6.5
LAUZON LAKE	4612	8250	41	2243.7	78	7	6.62		3.64	.	.
LEACHMAN LAKE	4654	8415	44	29.2	85	2	6.23		2.21	0.150	3.0
LITTLE PANACHE LAKE	4617	8122	45	130.7	81	6	7.62		26.13	0.012	10.6
LITTLE PICKEREL LAKE	4629	8318	41	194.5	80	8	6.70		3.20	.	.
LITTLE TOMIKO LAKE	4633	7927	43	310.9	82	5	5.72	*	.	.	2.1
LOON LAKE	4613	8142	42	151.1	81	6	6.93		10.09	0.074	5.2
LOW LAKE	4607	8134	42	30.3	80	1	7.14		18.45	0.020	8.8
MADAWANSON LAKE	4637	8211	42	416.5	81	7	6.63		2.52	0.020	2.2
MAGOG LAKE	4617	8250	41	309.0	81	6	6.68		3.50	0.049	2.8
MAHZENAZING LAKE	4604	8110	45	164.0	82	10	5.89	*	0.50	0.057	2.4
MANITOU LAKE	4651	8017	43	322.4	82	5	7.01		9.15	.	6.5
MARIAN LAKE	4646	7947	43	274.2	85	2	7.22		24.90	0.038	11.3
MASKINONGE LAKE	4647	8027	45	1427.7	81	6	6.14		0.66	0.060	4.0
MATINENDA LAKE	4622	8257	41	3864.7	78	7	6.72		3.26	.	.
MCCARTHY LAKE	4619	8228	41	657.9	79	9	6.75		5.50	.	.
MCFARLANE LAKE	4625	8059	45	140.7	78	7	7.80		17.55	.	.
MCQUABY LAKE	4602	7934	43	226.8	82	5	6.32		1.20	.	2.2
MEMESAGAMESING LAKE	4600	8000	43	1099.6	82	5	6.07		2.18	.	2.8
MENDELSSOHN LAKE	4732	8012	46	438.6	81	7	6.43		2.18	0.036	3.4
MEREDITH LAKE	4629	8355	44	302.9	80	6	7.23		6.00	.	.
MILTON LAKE	4555	7952	43	28.3	78	7	6.26		2.75	.	.
MOON LAKE	4624	8254	41	445.5	81	2	6.10		-2.10	.	.
MOOSE LAKE	4635	7925	43	98.3	85	2	5.61	*	0.36	0.131	2.0
MOUNT LAKE (MOUNTAIN)	4640	8244	41	346.7	81	6	7.00		6.34	0.010	3.8
MOUNTAIN LAKE	4714	7950	46	221.6	81	7	7.31		13.74	0.021	6.6
MURRAY LAKE	4640	8026	45	412.9	80	3	5.73	*	0.70	.	.
NELSON LAKE	4644	8105	45	316.1	81	7	6.71		1.54	0.028	3.8
NET LAKE	4706	7946	46	711.1	78	10	6.81		15.55	.	.
NORTH SPRUCE LAKE	4641	7932	43	356.2	85	2	5.54	*	0.93	0.279	3.4
OBABIKA LAKE	4705	8017	46	3157.5	81	7	6.73		4.18	0.034	4.2
OPECHEE LAKE	4647	7950	43	181.0	85	2	7.49		24.22	0.019	10.6
PATTEN LAKE	4632	8346	44	243.0	79	5	6.76		8.80	.	.
POPLAR LAKE	4640	7937	43	388.7	85	2	6.07		1.29	0.115	3.1
PRINCE LAKE	4634	8433	44	45.9	79	10	6.40		16.40	0.042	4.7
PRUGH LAKE (PINE)	4653	8418	44	51.2	85	2	6.27		1.90	0.087	2.7
RABBIT LAKE	4700	7938	46	2107.4	81	7	7.27		16.49	0.016	8.2
RAWHIDE LAKE	4639	8237	41	654.9	81	8	7.22		5.98	0.020	3.8
RED CEDAR LAKE	4645	7954	43	2423.5	81	7	6.98		15.32	0.038	6.8
RESTOULE LAKE	4603	7946	43	1238.2	81	6	6.46		3.80	0.038	3.2
RIB LAKE	4713	7943	46	685.2	81	7	7.33		13.28	0.020	6.2
ROBICHAUD LAKE (PINE)	4618	7908	43	126.8	85	2	7.25		12.71	0.003	4.7
ROCK LAKE	4626	8346	44	1029.5	78	8	7.32		12.70	.	.
RUTH LAKE	4601	7931	43	197.4	85	5	6.72		4.17	0.057	3.1
SAM MARTIN LAKE	4653	8048	45	153.1	81	7	6.05		0.88	0.031	4.0
SHEEDY LAKE	4617	7906	43	39.4	82	5	.		.	.	5.5
SMITH LAKE	4616	7856	43	188.8	82	5	.		.	.	3.2
SPITZIG LAKE	4701	8001	46	75.6	79	8	7.00		9.20	.	.
SUGAR LAKE	4721	8006	46	231.5	81	7	6.27		1.90	0.044	3.4

REGION=NORTHEASTERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
TENT LAKE	4651	7945	46	53.2	79	7	6.80		9.10	.	.
THREE NARROWS LAKE	4605	8127	45	948.1	81	7	5.70	*	0.25	0.072	2.8
TROUT LAKE	4613	8035	45	930.3	81	6	6.55		5.13	0.051	4.0
TROUT LAKE	4618	7920	43	1674.7	82	5	7.07		8.99	.	4.8
TUBE LAKE	4614	8217	42	114.8	78	7	6.58		3.10	.	.
TYSON LAKE	4607	8107	45	1143.1	81	7	5.29	**	-0.12	0.110	2.8
VERMILION LAKE	4630	8126	45	1079.0	82	5	7.00		.	.	6.9
WABAGISHIK LAKE	4618	8135	42	570.0	79	5	7.04		10.50	.	.
WAKOMATA LAKE	4634	8322	41	2470.5	81	6	7.08		5.44	0.009	3.4
WALKER LAKE	4612	8130	42	339.6	80	9	6.92		3.40	.	.
WASHAGAMI LAKE	4642	8028	45	269.6	80	3	5.48	**	0.10	.	.
WICKSTEED LAKE	4646	7940	43	1313.7	80	8	6.85		8.10	.	.
WINDY LAKE	4636	8127	45	1112.0	81	7	6.53		1.86	0.020	3.4
WISTIWASING LAKE	4608	7913	43	628.2	82	5	7.20		10.53	.	4.6
WOLFE LAKE	4652	8415	44	116.4	81	8	5.99	*	0.30	.	.

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
AHMIC LAKE	4537	7942	55	1567.0	78	7	6.71		3.99	.	.
AIRD LAKE	4508	7705	56	38.9	80	7	7.98		92.00	.	.
ANSTRUTHER LAKE	4445	7812	52	625.3	79	6	6.80		8.40	.	.
ARMSTRONG LAKE	4531	7955	55	22.0	83	2	6.58		9.51	0.071	4.6
ARNOLD'S BAY	4506	7957	55	109.2	83	2	6.56		3.61	0.039	3.3
ARROWHEAD LAKE (RAT)	4524	7912	53	62.1	78	7	6.86		.	0.060	4.2
AUBREY LAKE	4530	7821	51	9.1	82	11	6.29		3.93	0.015	2.8
AUSTIN LAKE	4507	7851	54	19.4	79	1	5.87	*	2.07	.	3.0
AYLEN LAKE	4537	7751	58	2016.1	82	10	6.89		9.62	0.015	3.9
BAPTISTE LAKE	4507	7803	52	2226.3	78	7	9.60		21.65	.	.
BARK LAKE	4456	7828	54	168.2	79	7	6.45		7.60	.	.
BARK LAKE	4527	7751	56	3791.9	82	10	6.59		4.35	0.026	3.5
BARNUM LAKE	4502	7832	54	31.6	80	9	7.61		68.50	.	24.1
BASIN LAKE	4544	7748	51	73.6	82	10	6.94		17.20	0.000	5.9
BASS LAKE	4441	7832	54	115.3	83	2	7.57		119.00	0.013	42.9
BASS LAKE	4452	7913	53	37.1	83	2	6.24		5.43	0.130	3.5
BASS LAKE	4506	7942	53	98.4	80	1	6.24		2.03	.	4.0
BASSHAUNT LAKE	4507	7828	54	47.5	80	1	6.56		6.90	.	4.8
BAY LAKE	4501	7752	52	87.4	78	7	8.65		91.50	.	.
BAY LAKE	4530	7912	53	132.8	80	10	6.48		2.79	.	.
BEAR LAKE	4520	7842	53	94.8	83	2	6.08		1.58	0.066	3.0
BEAR LAKE	4526	7935	55	279.0	80	8	6.02		1.60	.	.
BEAVER LAKE (NL)	4555	8017	55	23.3	83	2	6.34		5.20	0.034	3.0
BEECH LAKE	4505	7842	54	124.0	80	1	7.02		12.61	.	8.0
BEER LAKE	4456	7849	54	33.7	80	6	5.93	*	4.50	.	3.4
BELLA LAKE	4526	7902	53	328.1	83	2	6.62		5.28	0.002	3.3
BELLS LAKE	4536	7941	55	42.8	79	8	6.90		2.40	.	.
BENOIR LAKE	4511	7809	52	95.6	79	7	6.30		6.30	.	.
BERNARD LAKE	4545	7923	53	2059.0	81	7	6.78		5.33	0.020	3.6
BIG CEDAR LAKE	4436	7810	52	213.8	79	8	7.60		81.80	.	.
BIG DEEP BAY	4543	8016	55	120.5	83	2	6.37		3.98	0.083	3.4
BIG DEER LAKE	4546	7945	55	163.1	83	2	6.67		12.90	0.054	7.0
BIG HARDINGS LAKE	4501	7806	52	14.8	78	8	6.84		.	0.007	2.5
BIG HAWK LAKE	4510	7844	57	388.8	80	6	6.09		1.40	.	3.2
BIG MINK LAKE	4515	7805	52	138.5	80	1	6.28		5.24	.	.
BIG ORILLIA LAKE	4506	7900	53	45.3	83	2	6.34		3.66	0.019	2.6
BIG TROUT LAKE	4455	7856	54	204.0	83	2	6.01		2.38	0.100	2.5
BILLINGS LAKE	4456	7822	54	101.9	83	2	7.34		59.70	0.012	24.7
BIRCHCLIFFE LAKE	4556	7851	51	87.0	82	10	6.64		4.94	0.041	3.1
BLACK LAKE	4449	7849	54	67.7	83	2	6.41		4.60	0.045	2.7
BLACK LAKE	4502	7825	54	24.3	79	7	6.85		24.40	.	.
BLACK LAKE	4510	7855	57	60.8	80	8	6.18		1.16	.	2.4
BLACK OAK LAKE	4533	8013	55	87.6	83	2	6.05		2.28	0.098	2.7
BLACKSTONE HARBOUR	4509	7959	55	271.0	80	8	6.30		3.18	.	3.4
BLACKSTONE LAKE	4514	7953	55	516.0	80	8	6.54		3.77	.	3.6
BLUE HAWK LAKE	4500	7827	54	73.8	79	7	7.55		32.10	.	.
BLUE LAKE	4538	7956	55	3.6	83	2	5.18	**	0.82	0.160	2.6
BLUEROCK LAKE (NL)	4456	7815	54	13.0	83	2	6.88		19.30	0.034	8.4
BOB LAKE	4455	7847	54	219.9	80	6	6.67		7.95	.	5.0
BOLGER LAKE	4540	8010	55	340.4	80	10	5.72	*	0.80	.	.
BONNIE LAKE	4508	7916	53	41.9	82	3	6.51		1.54	0.009	2.4
BOOTH LAKE	4539	7812	51	538.6	82	10	6.66		5.75	0.007	3.3
BOSHKUNG LAKE	4504	7844	54	716.4	80	6	6.91		7.82	.	5.2

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
BOTTLE LAKE	4446	7817	54	143.0	83	2	6.35		5.78	0.110	4.3
BOULTER LAKE	4517	7803	52	41.3	83	5	7.01		4.38	.	.
BOW LAKE	4451	7833	54	50.7	83	2	7.49		51.90	0.002	17.3
BOWNES LAKE (NL)	4506	7825	54	17.7	83	2	5.79	*	2.96	0.100	3.5
BRADY LAKE	4503	7850	54	89.5	79	1	6.54		3.81	.	3.6
BRANDY LAKE	4506	7931	53	104.9	79	9	.		8.65	.	4.5
BRAY LAKE	4554	7928	53	375.8	83	2	6.08		1.61	0.025	2.7
BRIDLE LAKE	4540	7809	51	22.0	82	10	6.73		10.10	0.016	4.4
BROOKS LAKE	4452	7746	52	24.1	78	7	8.14		.	0.008	35.0
BROOKS LAKE	4527	7900	53	16.4	83	2	6.45		7.63	0.022	3.6
BRUCE LAKE	4511	7939	53	90.7	83	2	6.48		4.78	0.029	3.1
BRUSH LAKE	4516	7945	55	25.4	79	8	6.55		1.60	.	.
BUCK LAKE	4523	7900	53	39.5	79	11	6.24		4.27	.	.
BUCK LAKE	4525	7923	55	265.7	81	7	5.89	*	1.43	0.110	2.6
BUTTERFLY LAKE	4505	7938	53	65.4	80	1	6.29		7.15	.	5.2
BUZZARD LAKE	4440	7813	52	77.2	79	8	6.40		5.40	.	.
CACHE LAKE	4532	7835	51	290.9	82	10	6.30		3.51	0.014	3.1
CALABOGIE LAKE	4516	7645	56	1316.3	78	6	7.71		29.25	.	.
CAMEL LAKE	4510	7925	53	38.6	78	2	5.49	**	1.16	.	.
CAMERON LAKE (ENEAS)	4518	7724	56	42.1	78	6	8.22		62.00	.	.
CANISBAY LAKE	4534	7835	51	161.4	82	10	6.33		3.39	0.024	2.9
CANNING LAKE	4456	7838	54	244.1	83	2	7.14		21.00	0.016	8.6
CANOE LAKE	4533	7843	51	377.5	82	10	6.07		2.15	0.029	2.5
CARDWELL LAKE	4516	7755	52	42.9	83	5	6.89		7.29	.	.
CARIBOU LAKE	4556	8004	55	529.3	79	7	6.15		3.80	.	.
CATCHACOMA NARROWS	4443	7818	54	94.6	80	9	7.16		11.70	.	.
CAVENDISH LAKE (MCGINNIS)	4444	7817	54	23.5	83	2	6.78		11.10	0.038	6.2
CECEBE LAKE	4538	7933	55	770.3	82	5	6.80		.	.	3.4
CEDAR LAKE	4601	7828	51	2047.5	82	10	6.73		6.20	0.014	3.5
CHANDOS LAKE	4449	7800	52	1388.5	78	7	8.25		47.00	.	.
CHARCOAL LAKE (BURNT)	4516	7854	53	16.8	83	1	5.89	*	1.40	0.067	2.6
CHARLOTTE LAKE	4524	7726	56	112.1	78	6	8.60		55.50	.	.
CLEAR LAKE	4516	7947	55	220.2	78	7	6.08		.	0.017	2.6
CLEAR LAKE	4538	8007	55	83.7	83	2	5.71	*	1.36	0.088	2.5
CLEAR LAKE (SCHANERHORN)	4531	7916	53	98.6	80	8	7.15		3.80	.	.
CLEARWATER LAKE	4448	7914	53	72.1	81	2	5.82	*	1.24	.	.
CLEMENT LAKE	4503	7814	54	18.6	83	2	7.74		80.70	0.009	32.4
CLYDESDALE LAKE	4450	7801	52	112.3	80	8	8.00		38.10	.	.
COLDINGHAM LAKE	4533	7642	56	28.4	80	6	8.33		89.50	.	.
COLE LAKE	4525	8010	55	35.6	83	2	6.13		3.16	0.064	3.6
COLEMAN LAKE	4509	7833	54	23.5	83	2	6.72		16.80	0.042	7.6
CONTAU LAKE	4453	7826	54	129.8	79	7	7.70		39.70	.	.
COOK'S LAKE (NL)	4532	7951	55	14.8	83	2	6.54		14.70	0.053	7.4
COOPER LAKE	4521	7900	53	30.7	83	2	6.27		3.14	0.052	3.4
COSTELLO LAKE	4535	7819	51	7.5	82	11	6.29		3.78	0.033	3.4
CRANBERRY LAKE	4507	7834	54	76.3	78	6	7.25		13.15	.	.
CRANE LAKE	4513	7957	55	513.3	80	8	6.63		3.78	.	3.0
CROTCH LAKE	4523	7858	53	9.0	81	8	5.90	*	2.90	.	.
CRYSTAL LAKE	4445	7829	54	483.2	83	2	7.40		76.40	0.002	31.6
CUP LAKE	4501	7806	52	13.6	79	6	6.65		3.50	.	.
CUYLER LAKE (HORGAN)	4531	7904	53	30.4	83	1	5.31	**	0.46	0.012	2.9
DALRYMPLE LAKE	4438	7907	54	1333.6	83	2	7.64		133.60	0.010	48.6
DARLINGTON LAKE	4522	8002	55	19.4	83	2	6.78		12.60	0.018	7.6

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
DAVIS LAKE	4447	7843	54	93.9	78	8	8.16		.	0.020	24.8
DEER LAKE (DEETE)	4549	7934	55	368.6	82	5	6.44		2.18	.	2.8
DEER LAKE (NULTY)	4535	7917	53	119.0	83	1	5.92	*	1.88	0.120	3.0
DEVINE LAKE	4512	7914	53	40.1	83	2	5.41	**	0.46	0.130	2.3
DIAMOND LAKE	4523	7946	55	54.7	78	7	6.28		1.52	.	.
DOE LAKE	4532	7924	55	924.3	80	8	6.84		5.46	.	3.6
DOGFISH LAKE	4537	8008	55	77.6	79	8	6.15		1.20	.	.
DOLLARS LAKE	4556	8013	55	970.5	82	5	6.44		5.48	.	3.8
DOTTY LAKE	4528	7900	53	234.9	80	8	6.41		1.20	.	.
DRAG LAKE	4505	7824	54	911.7	.	.	6.94		20.20	0.030	8.4
DUCK LAKE	4440	7856	54	44.4	83	2	7.57		167.30	0.007	54.9
DUCK LAKE	4546	8008	55	68.2	83	2	5.89	*	1.69	0.069	2.3
DUCK LAKE	4553	8000	55	185.4	83	2	6.54		5.14	0.094	4.1
EAGLE LAKE	4508	7831	54	234.7	80	1	7.13		12.16	.	6.2
EAGLE LAKE	4550	7930	53	991.3	81	7	6.37		4.21	0.020	2.8
ECHO LAKE	4458	7933	53	95.6	80	1	5.75	*	2.50	.	3.2
ECHO LAKE	4511	7904	53	209.0	78	6	6.65		3.44	.	.
EELS LAKE	4454	7808	52	946.6	78	8	7.46		.	0.085	0.2
ELEPHANT LAKE	4508	7808	52	1095.8	79	8	7.55		18.60	.	.
EMSDALE LAKE (ISLAND)	4531	7912	53	60.9	83	1	6.36		3.08	0.022	2.6
ESSON LAKE	4501	7816	54	244.8	79	7	7.55		36.00	.	.
FAIRHOLME LAKE	4535	7954	55	66.3	79	8	6.60		9.20	.	.
FAIRY LAKE	4520	7911	53	712.1	79	4	6.40		3.87	.	3.8
FAWN LAKE (DEER)	4510	7915	53	86.7	79	9	5.56	*	0.52	.	.
FIFTEEN MILE LAKE (ANGLE)	4521	7858	53	86.1	80	1	6.35		3.87	.	4.2
FISHOG LAKE	4447	7853	54	86.7	82	1	6.56		8.92	0.045	5.6
FISHTAIL LAKE	4509	7812	52	246.9	80	7	6.83		12.30	.	.
FLAXMAN LAKE	4520	7950	55	62.8	80	10	5.99	*	1.50	.	.
FOREST LAKE	4549	7918	53	322.9	78	6	5.90	*	4.61	.	.
FORGET LAKE	4515	7954	55	36.8	80	8	7.17		3.98	.	3.6
FORTESCUE LAKE (BLACK)	4450	7826	54	78.7	83	2	7.39		63.00	0.027	25.8
FOUR MILE LAKE	4441	7845	54	786.8	80	10	7.84		89.40	.	.
FOWKE LAKE (SPRING)	4549	7940	55	243.8	79	10	6.93		14.65	.	.
FOX LAKE	4522	7921	53	136.7	79	8	5.98	*	2.35	.	.
FRENCH LAKE (COLTON)	4526	7651	56	62.4	80	6	8.50		145.60	.	.
GALEAIRY LAKE	4530	7817	51	7.5	82	10	6.40		3.64	0.027	2.9
GIBSON LAKE	4458	7945	55	263.7	83	2	6.04		3.52	0.110	2.5
GILBANK LAKE (BLACK)	4518	7945	55	18.7	83	2	6.08		2.60	0.033	2.9
GIROUX LAKE (BIG)	4543	8030	55	115.6	83	2	5.83	*	3.54	0.130	2.7
GLAMOR LAKE	4457	7822	54	194.0	79	7	7.30		32.60	.	.
GO HOME LAKE	4501	7953	55	666.5	83	2	6.59		3.89	0.039	3.5
GOLD LAKE	4443	7817	54	312.3	79	8	7.00		9.60	.	.
GOOSENECK LAKE	4540	8004	55	217.7	83	2	6.05		2.67	0.054	2.6
GORDON LAKE	4531	7823	51	33.8	82	11	6.49		3.88	0.016	3.3
GORMAN LAKE	4526	7726	56	67.2	78	6	8.65		61.50	.	.
GRACE LAKE	4504	7814	52	226.4	80	7	7.04		15.20	.	.
GRANDVIEW LAKE	4512	7903	53	77.0	80	7	7.08		7.52	.	3.8
GRAPE LAKE	4531	7840	51	16.4	82	10	6.48		3.66	0.023	2.7
GRASS LAKE	4502	7833	54	63.7	83	2	7.03		18.70	0.033	7.5
GREEN BASS LAKE (NL)	4523	8014	55	7.0	80	7	6.65		2.70	.	.
GREEN LAKE	4507	7837	54	119.1	78	6	7.52		12.45	.	.
GREENS LAKE (GRASSY)	4447	7823	54	54.5	83	2	7.31		62.50	0.014	20.4
GROOM LAKE	4532	7911	53	64.7	83	1	6.21		3.36	0.066	3.0

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
GRUNDY LAKE	4556	8034	55	62.2	78	7	7.90		16.85	.	.
GULL LAKE	4451	7847	54	995.8	79	6	7.05		15.80	.	.
GULL LAKE	4455	7921	53	127.9	83	2	6.59		6.00	0.025	3.6
GUN LAKE	4512	7850	57	67.1	82	10	5.69	*	1.55	0.050	2.2
HAGGART LAKE	4506	7945	55	32.6	83	2	5.54	*	1.81	0.110	4.0
HAINES LAKE	4521	7956	55	112.4	83	2	6.10		3.60	0.063	3.3
HALIBURTON LAKE	4512	7824	54	1013.6	78	6	7.30		8.70	.	.
HAPPY ISLE LAKE	4545	7830	51	536.2	82	10	6.75		3.85	0.000	2.9
HARDUP LAKE (POVERTY)	4524	7859	53	19.8	83	2	6.26		3.57	0.025	2.8
HARDWOOD LAKE	4512	7727	56	35.6	78	6	7.50		18.40	.	.
HARDY LAKE	4500	7932	53	97.9	80	1	6.29		3.09	.	4.2
HARP LAKE	4523	7907	53	71.7	81	7	.		3.65	0.036	2.8
HARRIS LAKE	4542	8022	55	363.4	80	10	6.18		3.60	.	.
HEAD LAKE	4444	7855	54	919.4	80	10	7.68		59.20	.	.
HEAD LAKE	4503	7831	54	62.2	83	2	6.91		16.10	0.053	6.7
HEADSTONE LAKE	4534	7812	58	51.8	83	5	6.68		3.21	.	.
HEALEY LAKE	4505	7911	53	119.1	79	10	5.69	*	1.06	.	.
HEALEY LAKE	4510	7955	55	763.4	79	7	5.90	*	2.30	.	.
HENRY LAKE	4540	7932	55	25.7	83	2	7.13		0.06	0.140	2.5
HERON LAKE	4527	7849	51	26.0	82	10	6.81		9.58	0.120	4.8
HIGH LAKE	4514	7930	53	64.8	83	2	6.45		4.15	0.019	3.3
HIMBURY LAKE (ROCK)	4536	7912	53	53.4	83	2	6.61		5.54	0.015	3.5
HINDON LAKE	4505	7847	54	33.2	83	2	6.62		12.80	0.018	5.3
HODSON LAKE (THREE MILE)	4535	7919	53	345.8	83	1	6.65		4.66	0.007	3.6
HOLLAND LAKE	4506	7747	52	29.8	80	8	7.75		19.10	.	.
HORSE LAKE	4455	7731	52	29.9	79	7	8.70		80.80	.	.
HORSESHOE LAKE	4518	7951	55	370.2	80	8	6.43		5.75	.	3.4
HUGHES LAKE	4542	7934	55	60.0	83	2	5.09	**	0.04	0.092	2.4
HURRICANE LAKE	4505	7836	54	63.4	80	9	6.41		5.00	.	.
ISABELLA LAKE	4524	7949	55	178.9	80	8	6.72		3.80	.	.
ISLAND LAKE	4548	8004	55	665.3	81	7	5.72	*	0.77	0.039	1.8
ISLET LAKE	4537	7853	51	137.2	84	10	5.95	*	0.68	0.010	2.1
JACK'S LAKE (BURDEN)	4540	7920	53	88.4	83	1	5.69	*	2.90	0.085	3.4
JAMIESON LAKE	4504	7741	52	46.2	80	8	8.73		92.90	.	.
JEFFREYS LAKE (OLMSTED)	4535	7648	56	118.1	78	10	7.97		.	.	41.0
JESSOP LAKE (JINGO)	4523	7916	53	27.1	83	2	5.28	**	0.74	0.091	2.7
JOHNSTON LAKE	4527	7959	55	9.7	83	2	5.74	*	1.18	0.052	2.2
KABAKWA LAKE	4507	7848	57	114.8	79	1	6.83		7.16	.	5.6
KAHSHE LAKE	4450	7918	53	751.2	81	2	6.21		5.07	.	.
KAMANISKEG LAKE	4525	7741	56	2908.8	80	1	6.69		5.59	.	.
KAPIKOG LAKE	4509	7954	55	317.1	80	8	6.32		2.84	.	2.2
KASHAGAWIGAMOG LAKE	4459	7836	54	817.9	80	1	7.07		20.53	.	10.4
KASHEGABA LAKE	4542	8008	55	416.9	79	8	6.00		2.10	.	.
KASSHABOG LAKE	4438	7758	52	890.7	79	8	7.20		15.90	.	.
KAWAGAMA LAKE	4518	7845	53	2821.0	80	1	6.41		2.45	.	4.6
KAWIGAMOG LAKE	4553	8016	55	551.0	79	8	6.30		6.10	.	.
KEARNEY LAKE	4534	7826	51	34.6	82	11	6.28		3.85	0.047	3.2
KEILLER LAKE	4532	7936	55	73.9	83	2	6.53		9.64	0.081	6.8
KERNICK LAKE (PIKE)	4537	7921	53	44.2	83	1	6.14		1.77	0.013	2.7
KIMBALL LAKE	4521	7841	53	212.6	82	10	6.27		1.49	0.018	2.7
KING LAKE	4553	7930	55	29.2	82	5	6.18		0.93	.	2.5
KITTY LAKE	4539	7809	51	44.5	82	10	6.62		5.94	0.013	3.3
KOSHLONG LAKE	4458	7829	54	401.2	.	.	6.28		2.19	0.050	3.4

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
KUSHOG LAKE	4504	7847	57	640.0	78	6	6.81		3.07	.	.
L'AMABLE LAKE	4501	7749	52	182.5	78	7	8.55		93.00	.	.
LAC DU BOIS DUR	4553	7723	56	242.3	80	7	6.40		9.90	.	.
LAC LAVALLEE	4536	8006	55	65.8	83	2	5.59	*	1.21	0.120	2.5
LAKE CLEAR	4526	7712	56	1727.1	80	7	8.41		97.90	.	.
LAKE DORE	4537	7707	56	1467.7	80	6	7.97		69.80	.	.
LAKE JOSEPH	4511	7947	53	5155.6	78	7	6.68		1.92	.	.
LAKE OF BAYS	4515	7904	53	7058.1	80	2	6.58		3.14	.	4.0
LAKE OF MANY ISLANDS	4546	7941	55	219.9	78	7	7.22		15.10	.	.
LAKE OF TWO RIVERS	4535	7829	51	7.9	82	10	6.37		3.73	0.024	3.4
LAKE ROSSEAU	4510	7935	53	6374.4	80	2	6.44		3.44	.	4.0
LASSWADE LAKE	4446	7800	52	30.9	80	8	7.29		20.80	.	.
LAST LAKE	4549	8012	55	206.6	83	2	5.93	*	2.00	0.074	2.4
LEECH LAKE	4503	7906	53	82.1	80	1	5.66	*	1.04	.	1.8
LEONARD LAKE	4504	7927	53	189.1	79	9	5.46	**	0.31	.	.
LIMESTONE LAKE	4504	7734	52	45.3	80	8	8.75		115.30	.	.
LIMESTONE LAKE	4533	7956	55	66.7	79	7	6.90		18.10	.	.
LINDA LAKE	4537	7836	51	101.6	82	10	6.27		2.31	0.018	3.0
LIONESS LAKE	4519	7952	55	9.8	83	2	6.03		2.90	0.040	2.7
LITTLE BOSHKUNG LAKE	4502	7844	54	126.8	80	1	6.88		8.55	.	6.0
LITTLE CAMERON LAKE (NL)	4507	7839	54	17.7	83	2	6.57		10.20	0.028	4.2
LITTLE CLAM LAKE	4532	7909	53	22.0	83	1	6.14		2.56	0.039	2.5
LITTLE DUDMON LAKE	4502	7821	54	59.1	80	1	7.39		35.06	.	16.0
LITTLE ESSON LAKE (CEDAR	4502	7816	54	60.1	83	2	7.22		40.30	0.009	15.9
LITTLE GLAMOR LAKE	4458	7822	54	63.6	83	2	6.70		22.90	0.024	10.8
LITTLE GULL LAKE	4450	7848	54	16.2	83	2	6.53		6.42	0.023	3.2
LITTLE HAWK LAKE	4509	7843	57	342.8	80	6	6.17		1.15	.	3.0
LITTLE HAY LAKE	4521	7816	51	90.4	82	10	6.47		4.63	0.031	3.5
LITTLE JOE LAKE	4536	7842	51	48.6	82	10	6.31		2.78	0.017	3.1
LITTLE LAKE (NL)	4453	7928	53	29.7	83	2	6.16		3.32	0.047	3.0
LITTLE LAKE JOSEPH	4513	7941	55	288.3	80	8	6.97		3.10	.	.
LITTLE MARGARET LAKE	4508	7854	53	22.5	82	1	6.29		2.33	0.017	2.2
LITTLE MCKELLAR LAKE	4531	7956	55	158.9	83	2	6.56		10.00	0.036	5.4
LITTLE SEGUIN LAKE (DUCK)	4523	7948	55	86.9	83	2	6.29		2.96	0.087	2.7
LITTLE WHITEFISH LAKE	4517	7948	55	160.4	83	2	6.20		2.24	0.024	3.0
LITTLE WILSON LAKE	4538	8017	55	42.0	83	2	5.76	*	0.90	0.120	2.3
LIVINGSTONE LAKE	4522	7843	53	189.3	80	1	6.46		3.54	.	4.4
LOCHLIN LAKE	4457	7831	54	30.1	83	2	5.43	**	0.49	0.056	2.2
LONG BAY (LITTLE LONG)	4554	8003	55	166.5	83	2	6.62		5.88	0.039	3.7
LONG LAKE	4441	7810	52	90.7	79	7	6.50		8.30	.	.
LONG LAKE	4500	7936	53	123.9	80	1	6.76		9.00	.	6.2
LONG LAKE	4503	7822	54	88.3	79	6	7.30		35.90	.	.
LONG LAKE	4516	7945	55	27.5	83	2	6.11		2.68	0.029	2.5
LONG LAKE	4521	7955	55	17.0	83	2	5.63	*	1.21	0.078	2.3
LOOM LAKE	4445	7827	54	43.7	83	2	7.42		107.00	0.000	35.4
LOON CALL LAKE	4444	7809	52	86.4	79	7	7.60		11.00	.	6.0
LOON LAKE	4525	7859	53	31.5	83	2	5.63	*	5.33	0.017	3.2
LORIMER LAKE	4532	7958	55	459.0	78	7	6.93		.	0.044	5.6
LORWALL LAKE	4525	7722	56	81.7	80	7	8.34		106.20	.	.
LOWER CUP LAKE (NL)	4501	7806	52	9.5	79	6	6.55		4.50	.	.
LOWER MONMOUTH LAKE	4453	7812	54	72.7	83	2	6.88		25.50	0.093	11.7
LOWER PAUDASH LAKE	4458	7801	52	449.4	79	8	7.45		25.60	.	.
LOWER WELCH LAKE	4506	7847	54	16.0	83	2	6.87		21.20	0.016	8.2

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
LOWRY LAKE	4456	7815	54	11.8	79	6	7.10		17.90	.	.
LUTTERWORTH LAKE (DEVIL'S	4452	7850	54	56.6	83	2	5.84	*	2.12	0.059	1.9
MANITOUWABA LAKE	4524	7942	55	164.5	83	2	5.13	**	-0.08	0.091	1.5
MANITOUWABING LAKE	4529	7954	55	1250.6	79	7	6.45		7.70	.	.
MANSON LAKE (MOFFAT)	4533	7952	55	81.3	83	2	6.59		7.84	0.055	4.8
MAPLE LAKE	4522	7948	55	201.1	78	7	6.63		2.96	.	.
MARTIN LAKE (MARTIN'S)	4522	7951	55	109.0	83	2	6.41		6.55	0.024	3.7
MARY JANE LAKE	4531	7951	55	46.0	83	2	7.16		33.10	0.025	14.9
MARY LAKE	4515	7915	53	1066.3	81	7	6.49		3.43	0.056	3.2
MASON LAKE	4538	7914	53	48.6	83	1	6.10		2.73	0.058	2.7
MAYER LAKE	4531	7910	53	23.0	81	9	5.80	*	1.50	.	.
MCCAULEY LAKE	4533	7807	58	121.5	80	1	6.41		4.90	.	.
MCCOY LAKE	4517	8001	55	49.4	80	8	6.26		1.47	.	2.4
MCDOUGALL LAKE (PORTAGE)	4524	8003	55	69.3	83	2	6.05		2.59	0.099	2.2
MCEWEN LAKE	4531	7955	55	19.5	83	2	6.29		5.71	0.075	4.0
MCKAY LAKE	4503	7910	53	138.5	79	10	5.62	*	1.18	.	2.4
MCKELLAR LAKE	4531	7956	55	85.6	83	2	6.52		8.42	0.058	4.4
MCKENZIE LAKE	4522	7801	58	311.9	80	1	6.45		8.24	.	.
MCNEVIN LAKE	4536	7759	51	83.5	82	10	6.57		4.87	0.009	4.1
MCNUTT LAKE	4519	7956	55	39.7	83	2	6.23		4.26	0.062	3.6
MCQUILLAN LAKE	4512	7954	55	35.9	80	8	6.03		1.08	.	2.6
MEDORA LAKE	4504	7939	53	48.0	83	2	5.86	*	1.52	0.079	2.1
MENOMINEE LAKE	4512	7909	53	97.3	82	3	6.13		1.20	0.098	2.6
MILLER LAKE	4526	8000	55	9.2	83	2	6.62		8.36	0.012	4.4
MILLWARD LAKE	4455	7853	54	63.5	80	7	6.55		3.12	.	2.4
MINDEN LAKE	4457	7842	54	53.3	83	2	7.02		10.20	0.008	5.2
MISKOKWAY LAKE	4539	8014	55	237.7	80	10	5.82	*	0.90	.	.
MISKWABI LAKE	4503	7819	54	268.1	78	8	8.05		.	0.028	13.4
MISSISSAGUA LAKE	4442	7819	54	587.6	80	9	6.90		11.40	.	.
MOCCASIN LAKE	4540	7852	51	31.3	82	10	6.01		1.70	0.035	2.3
MOFFAT LAKE (SQUAW)	4532	7953	55	52.4	83	2	6.36		9.62	0.089	5.6
MONCK LAKE	4500	7807	52	143.4	80	8	6.08		1.80	.	.
MONMOUTH LAKE	4454	7812	54	76.6	80	9	7.45		31.40	.	.
MONROCK LAKE	4458	7812	54	24.0	80	9	6.14		1.30	.	.
MONTGOMERY LAKE	4512	7912	53	14.0	83	2	5.62	*	1.02	0.068	2.2
MOON RIVER BAY	4507	7958	55	122.9	83	2	6.54		3.66	0.042	3.3
MOORE LAKE	4448	7848	54	182.7	83	2	7.10		12.90	0.018	5.9
MOORE LAKE	4526	7801	58	308.4	80	1	6.49		4.17	.	.
MOOSE LAKE	4509	7828	54	289.7	80	1	7.14		14.36	.	6.6
MOOSE LAKE	4537	8023	55	36.3	83	2	5.69	*	1.39	0.110	2.8
MOOT LAKE	4509	7910	53	46.3	78	2	4.86	***	0.43	.	.
MORRISON LAKE	4452	7927	53	248.8	80	1	6.11		3.47	.	3.2
MOUNTAIN LAKE (MINDEN)	4459	7843	54	319.6	78	6	7.15		12.15	.	.
MOWAT LAKE (NL)	4552	8024	55	109.4	83	2	5.49	**	2.24	0.110	2.8
MUSKRAT LAKE	4540	7655	56	1199.6	80	7	8.10		99.50	.	.
MUTTON LAKE	4521	7946	55	45.0	83	2	6.09		3.49	0.088	2.8
NEWELL LAKE (CLEAR)	4536	7941	55	46.0	83	2	6.89		7.00	0.013	4.1
NINE MILE LAKE	4457	7935	53	227.6	80	1	6.04		2.24	.	2.4
NOGANOSH LAKE	4549	8016	55	501.1	79	7	5.80	*	2.50	.	.
NORTH LAKE	4515	7824	54	77.8	80	1	5.49	**	0.27	.	3.6
NORTH PIGEON LAKE	4453	7847	54	46.9	79	6	6.70		8.80	.	.
NORWAY LAKE	4520	7643	56	271.0	80	6	8.01		109.40	.	.
NUNIKANI LAKE	4512	7844	57	115.7	82	10	6.15		1.85	0.071	2.7

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
NUTT LAKE (MUD)	4513	7927	53	7.9	83	2	6.93		17.60	0.028	8.7
OASTLER LAKE	4519	7958	55	116.0	80	8	6.53		5.95	.	4.2
OBLONG LAKE	4511	7826	54	91.1	80	1	6.94		10.69	.	5.8
OLD MANS LAKE	4537	7939	55	91.4	82	5	6.60		.	.	4.7
OLIVER LAKE	4531	7948	55	52.0	83	2	7.33		39.20	0.024	17.0
OPEONGO LAKE	4542	7823	51	5158.1	82	10	6.53		4.30	0.018	3.3
ORLEY LAKE	4512	7848	57	6.1	81	8	5.69	*	0.40	.	.
OTTER LAKE (BIG OTTER)	4517	7958	55	506.5	81	7	6.36		2.36	0.040	2.8
OUDAZE LAKE	4527	7911	53	121.9	78	6	6.70		3.91	.	.
OXBOW LAKE	4526	7858	53	169.3	80	1	6.13		3.18	.	4.0
OXTONGUE LAKE	4522	7855	53	249.5	80	7	6.15		2.51	.	2.4
PALETTE LAKE	4525	7917	53	16.2	83	2	6.51		9.51	0.014	4.0
PAPINEAU LAKE	4521	7749	52	792.2	80	1	6.45		8.41	.	.
PARK LAKE (LONG)	4525	7851	51	44.9	82	10	6.29		4.56	0.058	3.2
PARTRIDGE LAKE	4533	8008	55	90.2	80	10	6.19		3.50	.	.
PARTRIDGE LAKE (SHALLOW)	4508	7847	57	6.0	78	6	7.20		9.95	.	.
PAUGH LAKE	4535	7742	56	711.8	79	8	6.97		9.00	.	.
PENCIL LAKE	4448	7821	54	76.6	83	2	7.08		42.30	0.026	15.8
PENFOLD LAKE	4516	7917	53	31.2	83	2	6.51		14.50	0.120	6.3
PENINSULA LAKE (PEN)	4520	7906	53	865.4	79	4	6.85		7.15	.	4.6
PERCY LAKE (PINE)	4512	7822	54	595.6	78	8	7.43		.	.	5.6
PETERS LAKE	4532	7909	53	48.6	83	1	6.30		3.89	0.031	3.0
PICARD LAKE (BIG CEDAR)	4447	7823	54	75.8	83	2	7.47		82.10	0.024	30.8
PICKEREL LAKE	4541	7918	53	513.4	79	7	5.85	*	2.80	.	.
PINE LAKE	4507	7835	54	111.8	78	6	7.31		13.35	.	.
PLATE LAKE	4521	7955	55	7.0	83	2	5.84	*	2.04	0.069	2.7
POG LAKE	4534	7827	51	34.3	82	11	6.39		3.81	0.025	3.3
PONSFORD LAKE (BOUNDARY)	4521	7941	55	48.6	83	2	5.08	**	0.09	0.130	1.3
POOL LAKE	4542	7922	53	113.5	83	1	5.46	**	0.72	0.130	2.8
PORTAGE LAKE	4501	7823	54	14.9	83	2	6.86		21.00	0.010	12.9
PORTAGE LAKE	4513	7948	55	97.6	83	2	6.41		4.03	0.025	4.4
POTTER LAKE	4537	7847	51	95.1	82	10	6.02		1.68	0.043	2.2
PROSPECT LAKE	4459	7908	53	69.1	82	1	6.03		1.68	0.074	3.2
PROVOKING LAKE	4534	7830	51	110.4	82	10	6.06		2.21	0.024	2.5
PURDY LAKE	4521	7744	52	132.8	78	7	7.03		7.00	.	.
PUSEY LAKE	4503	7813	52	54.3	80	1	7.24		25.78	.	12.8
RADIANT LAKE	4600	7817	51	698.3	82	10	6.58		6.82	0.017	3.7
RAIN LAKE	4537	7856	51	168.4	84	10	6.24		1.53	0.011	2.3
RAINY LAKE	4532	7930	55	226.3	80	8	7.02		5.10	.	.
RANGER LAKE (SAND)	4509	7851	57	11.3	78	5	5.60	*	4.87	.	.
RANKIN LAKE	4518	7954	55	140.3	80	8	6.87		7.69	.	4.8
RAVEN LAKE	4512	7851	57	560.7	82	10	6.11		1.61	0.019	2.2
REBECCA LAKE	4526	7902	53	210.7	80	1	6.48		4.77	.	5.4
RED CHALK LAKE	4511	7857	53	58.3	81	7	.		3.85	0.022	2.4
RED PINE LAKE	4512	7842	57	380.3	81	7	6.44		1.40	0.022	2.6
REGISTERED LAKE (NL)	4501	7752	52	3.8	79	6	8.00		134.30	.	.
RICHMOND LAKE	4520	7959	55	38.1	82	5	7.06		.	.	7.6
RIL LAKE	4510	7900	53	146.0	80	7	6.27		2.15	.	2.8
RILEY LAKE	4450	7911	53	125.8	81	2	5.99	*	4.30	.	.
RIPPLE LAKE (DEEP)	4525	7917	53	19.5	83	2	6.24		3.64	0.039	3.1
ROBINSON LAKE	4455	7743	52	35.6	78	7	7.85		32.15	.	.
ROCK ISLAND LAKE	4533	8015	55	144.9	80	9	6.31		2.50	.	.
ROCK LAKE	4531	7824	51	499.3	82	10	6.36		3.59	0.021	.

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
ROSE LAKE	4514	7921	53	30.4	83	2	5.23	**	0.53	0.140	1.8
ROUND LAKE	4528	7924	55	190.4	83	2	6.01		2.26	0.067	3.3
ROUND LAKE	4538	7730	56	3068.8	78	10	7.63		.	.	8.0
ROUND LAKE (NL)	4450	7825	54	7.8	83	2	7.11		48.20	0.030	18.9
RUSTYSHOE LAKE (NL)	4452	7824	54	29.7	83	2	6.90		29.70	0.043	12.7
RYDE LAKE	4454	7915	53	81.8	81	2	6.29		4.10	.	.
RYE LAKE (PICKEREL)	4551	7943	55	104.4	79	8	6.35		7.50	.	.
SALERNO LAKE	4451	7829	54	144.7	78	6	7.90		42.80	.	.
SALMON LAKE	4449	7827	54	171.9	83	2	7.73		78.90	0.018	29.3
SALMON LAKE	4515	7958	55	68.1	80	8	6.14		1.91	.	2.4
SALMON TROUT LAKE	4511	7749	52	100.4	78	7	7.05		18.05	.	.
SAND LAKE	4539	7911	53	534.8	80	8	6.61		2.95	.	3.0
SANFORD LAKE	4456	7730	52	16.2	79	7	7.75		111.60	.	.
SAWYER LAKE	4539	7854	51	45.8	84	10	6.17		1.11	0.018	2.3
SECOND LAKE	4516	7952	55	23.4	79	6	7.20		6.10	.	.
SEQUIN LAKE	4532	7941	55	109.3	83	2	6.16		2.76	0.052	3.7
SEVENTEEN MILE LAKE	4522	7858	53	18.6	83	2	6.05		3.07	0.049	3.1
SHALL LAKE	4539	7804	51	54.3	82	10	6.57		6.05	0.017	3.4
SHEBESHEKONG LAKE	4526	8011	55	158.4	80	9	6.21		3.20	.	.
SHELDON LAKE	4451	7850	54	53.0	83	2	6.09		3.50	0.086	2.2
SILENT LAKE	4455	7804	52	115.1	80	7	6.90		5.00	.	.
SILVER LAKE	4507	7934	53	54.8	81	9	6.70		7.80	.	.
SINCLAIR LAKE	4546	8012	55	117.2	83	2	5.76	*	1.48	0.039	1.9
SIX MILE LAKE (NAISCOOT)	4539	8021	55	235.6	78	7	6.60		1.60	.	.
SIXTEEN MILE LAKE (LONG)	4522	7858	53	78.2	83	2	6.22		3.20	0.056	3.0
SMOKE LAKE	4531	7841	51	607.5	81	7	6.46		2.36	0.020	2.8
SMOKY LAKE	4551	8015	55	199.6	80	10	6.22		2.40	.	.
SNAKESKIN LAKE	4538	8001	55	84.2	83	2	5.82	*	2.16	0.096	3.3
SNOWSHOE LAKE	4548	7949	55	94.9	79	8	6.70		7.20	.	.
SOLITAIRE LAKE	4523	7901	53	122.5	83	2	6.44		3.58	0.006	2.6
SOURCE LAKE	4533	7839	51	276.8	82	10	6.30		2.82	0.011	2.7
SOUTH LAKE	4455	7841	54	88.6	83	2	7.14		53.00	0.008	20.1
SOUTH PORTAGE LAKE	4503	7824	54	42.5	83	2	6.99		21.50	0.023	10.7
SOYERS LAKE	4501	7837	54	329.4	79	8	7.12		15.15	.	8.3
SPAR LAKE (NL)	4447	7847	54	12.5	83	2	6.99		18.00	0.008	7.6
SPARROW LAKE	4447	7924	53	1124.8	83	2	7.90		84.25	0.063	31.0
SPECTACLE LAKE	4521	7949	55	13.7	83	2	5.75	*	1.94	0.041	2.2
SPENCE LAKE	4532	7938	55	114.5	83	2	6.21		2.17	0.028	3.0
SPIDER LAKE (COWPER)	4515	8003	55	480.9	80	8	6.16		2.45	.	2.6
SPRING LAKE	4455	7743	52	26.6	78	7	6.90		13.35	.	.
SPRING LAKE (NL)	4501	7908	53	25.8	83	2	5.88	*	1.17	0.037	2.6
SQUAW LAKE	4600	8021	55	132.9	83	2	6.68		6.66	0.100	4.4
ST. MARY LAKE	4513	7857	53	137.7	83	1	6.46		5.43	0.030	3.6
ST. NORA LAKE	4509	7850	57	262.0	80	6	6.18		2.12	.	3.0
STARVATION LAKE	4548	7913	53	19.9	83	2	5.81	*	1.33	0.100	3.1
STEENBURG LAKE	4450	7741	52	280.7	78	7	8.50		52.50	.	.
STEVENSON LAKE	4541	7736	56	42.3	80	6	7.12		13.50	.	.
STEWART LAKE	4508	7946	55	150.3	83	2	6.82		9.64	0.043	6.2
STORMY LAKE	4458	7824	54	78.1	80	1	6.51		4.49	.	.
STUBBS LAKE (TROUT)	4530	7744	56	137.0	79	8	7.13		12.30	.	.
STURGEON BAY	4536	8024	55	595.3	79	7	7.70		23.80	.	.
SUCKER LAKE	4446	7816	52	153.9	79	8	6.10		4.50	.	.
SUCKER LAKE	4515	7941	55	103.7	79	5	6.14		2.15	.	.

SAMPLED SMALLMOUTH BASS LAKES IN ONTARIO

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
SUGAR LAKE	4522	7946	55	148.7	79	5	5.94	*	1.12	.	.
SUNNY LAKE	4455	7918	53	40.0	81	2	6.29		2.56	.	.
TALBOT LAKE	4442	7851	54	124.9	83	2	7.09		133.50	0.021	45.2
TALLAN LAKE	4451	7803	52	45.7	80	8	8.41		93.60	.	.
TASSO LAKE	4527	7856	53	170.1	80	8	6.80		0.00	.	.
TATTLER LAKE	4539	7814	51	48.5	82	10	6.65		6.62	0.021	3.6
TAYLOR LAKE	4541	7958	55	78.5	83	2	6.46		7.45	0.086	5.0
TEA LAKE	4531	7844	51	142.8	82	10	6.24		2.41	0.033	2.4
TEDIOUS LAKE	4510	7835	54	34.5	80	7	6.44		5.69	.	3.2
TEN MILE LAKE (LONG)	4522	7939	55	32.1	83	2	5.33	**	0.94	0.140	1.4
THIRD LAKE	4516	7953	55	36.9	80	8	6.09		6.41	.	3.8
THREE LEGGED LAKE	4516	8001	55	177.8	80	8	6.25		2.01	.	2.4
THREE MILE LAKE	4510	7927	53	929.9	78	7	6.00		7.95	.	.
TIFFIN LAKE	4514	7948	55	73.7	83	2	6.31		5.76	0.064	5.1
TIMBER WOLF LAKE	4541	8018	55	23.3	83	2	5.55	*	1.20	0.120	2.3
TIP UP LAKE	4541	7816	51	10.9	82	10	6.68		5.45	0.110	3.2
TOAD LAKE	4554	8003	55	290.1	83	2	6.59		6.48	0.086	4.8
TOCK LAKE (OTTER)	4516	7853	53	116.6	83	1	6.17		2.21	0.021	2.4
TOOKE LAKE	4511	7908	53	32.6	83	2	5.99	*	2.45	0.039	2.6
TORONTO LAKE	4507	7946	55	13.6	83	2	5.30	**	0.34	0.100	2.3
TORRANCE LAKE (CLEAR)	4459	7933	53	146.7	83	2	6.57		2.77	0.013	3.2
TORY LAKE (DACKS)	4457	7816	54	19.1	83	2	7.05		17.00	0.008	9.2
TRAVES LAKE	4514	7955	55	30.7	83	2	5.92	*	2.07	0.037	2.6
TROUT LAKE	4517	7944	55	82.4	79	5	6.33		2.25	.	.
TROUT LAKE	4526	7959	55	226.0	80	10	5.79	*	0.90	.	.
TROUT LAKE (NL)	4531	7916	53	19.4	83	1	6.24		4.90	0.050	3.3
TURTLE LAKE	4439	7815	52	40.0	82	1	6.41		7.60	.	.
TURTLE LAKE (NL)	4518	7943	55	121.1	79	5	6.37		2.50	.	.
TWELVE MILE LAKE	4524	7901	53	10.2	83	2	6.36		4.37	0.016	3.1
TWO ISLANDS LAKE	4501	7843	54	336.8	.	.	6.81		9.02	0.020	5.4
VICTORIA LAKE	4504	7822	54	57.3	80	1	7.16		25.61	.	12.6
VIRTUE LAKE	4537	7801	51	892.3	79	8	6.30		5.00	.	.
WADSWORTH LAKE	4519	7950	55	22.7	80	6	7.00		4.40	.	.
WAHWASHKESH LAKE	4526	7735	56	198.8	78	6	7.56		21.25	.	.
WALKER LAKE	4543	8002	55	1721.3	78	7	6.19		.	.	.
WASEOSA LAKE	4523	7905	53	74.9	79	11	6.35		4.22	.	4.2
WATT LAKE (WATTS)	4524	7917	53	156.7	80	8	6.80		4.40	.	.
WEST LAKE (POLLYWOG)	4510	7805	52	32.8	83	5	6.96		5.19	.	.
WEST TWIN LAKE	4508	7827	54	52.2	83	2	7.04		21.60	.	.
WHALLEY LAKE	4439	7754	52	41.1	80	8	6.70		10.60	0.044	7.4
WHITE LAKE	4542	7940	55	96.5	79	5	6.32		2.87	.	.
WHITEFISH LAKE	4450	7829	54	175.1	83	2	7.38		67.70	.	.
WHITEFISH LAKE	4518	7947	55	294.8	78	7	6.44		.	0.018	27.2
WHITESTONE LAKE	4533	7825	51	205.7	82	10	6.52		4.29	0.042	3.0
WILBERMERE LAKE (POVERTY)	4539	7952	55	698.2	79	5	6.60		7.65	0.028	3.5
WILSON LAKE	4500	7813	54	44.2	83	2	7.26		36.30	.	.
WINDY LAKE	4536	8015	55	119.4	83	2	5.76	*	0.87	0.012	16.0
WOLF LAKE	4552	8011	55	101.0	80	10	6.20		2.60	0.100	2.2
WOLFKIN LAKE	4444	7811	52	126.0	79	6	6.75		4.00	.	.
WOOD LAKE	4514	7857	53	16.8	80	7	6.57		6.31	.	.
WOODS LAKE	4501	7905	53	378.3	80	7	6.31		2.63	.	5.0
WRIGHT LAKE	4516	7936	53	8.1	83	2	5.55	*	1.23	0.082	2.4
	4545	7817	51	64.9	82	10	6.62		6.09	0.031	2.1
											3.5

REGION=ALGONQUIN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
YANKTON LAKE	4505	7816	54	76.8	83	2	6.78		11.70	0.017	6.8
YOUNG LAKE (TROUT)	4513	7933	53	109.4	80	2	6.59		5.25	.	3.8

SAMPLED SHALLMOUTH BASS LAKES IN ONTARIO

REGION=EASTERN

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
ASHBY LAKE	4505	7721	66	259.5	80	1	7.04		10.66	.	.
BOBS LAKE	4441	7635	64	2451.1	78	6	8.33		.	.	.
BUCKSHOT LAKE (INDIAN)	4500	7704	66	439.3	78	6	8.40		.	.	.
BURRIDGE LAKE	4440	7633	64	80.9	78	6	8.67		.	.	.
CHARLESTON LAKE	4432	7600	61	2519.1	78	6	8.47		77.50	.	.
CLEAR LAKE (BIG CLEAR)	4433	7628	64	169.1	80	8	7.65		20.40	.	.
COLLINS LAKE	4422	7628	64	326.4	78	6	8.31		.	.	.
DALHOUSIE LAKE	4458	7634	63	591.3	78	6	8.00		44.30	.	.
DEVIL LAKE	4435	7627	64	1062.3	78	7	8.60		.	.	.
DICKEY LAKE	4447	7744	66	207.9	81	1	7.16		52.90	0.016	22.6
DOG LAKE	4425	7621	64	964.7	78	6	9.18		39.95	.	.
EFFINGHAM LAKE	4500	7723	66	197.2	80	1	6.44		4.41	.	.
GANANOQUE LAKE	4427	7609	61	616.7	80	8	7.81		103.50	.	.
GRAHAM LAKE	4434	7553	61	265.3	78	5	8.41		62.00	.	.
INGLESBY LAKE	4427	7703	66	169.3	78	6	8.36		92.00	.	.
LONG LAKE	4448	7615	63	85.1	80	8	8.20		75.10	.	.
LONG MALLORY LAKE	4500	7710	66	63.4	80	1	6.17		4.60	.	.
LOWER BEVERLEY LAKE	4436	7608	61	767.1	80	7	8.00		112.00	.	.
NEWBORO LAKE	4438	7620	61	1617.9	80	7	7.59		79.80	.	.
OPINICON LAKE	4434	7619	61	787.3	78	7	9.10		.	.	.
OTTER LAKE	4447	7607	61	602.6	78	5	8.68		104.00	.	.
OTTER LAKE (COTTER)	4504	7723	66	305.9	80	1	6.87		10.19	.	.
PALMERSTON LAKE	4501	7651	66	539.1	78	6	8.39		.	.	.
PRINGLE LAKE	4452	7714	66	94.7	80	1	6.05		4.77	.	.
RED HORSE LAKE	4432	7605	61	302.0	80	8	7.90		111.70	.	.
RIDEAU LAKE	4446	7613	61	6484.1	80	11	7.61		88.50	.	.
ROUND LAKE (LELAND)	4425	7626	64	50.3	78	6	8.45		.	.	.
SHARBOT LAKE	4446	7641	66	819.7	78	6	8.11		.	.	.
SHELDRAKE LAKE	4449	7717	66	185.8	80	1	6.59		7.31	.	.
SILVER LAKE	4450	7636	63	245.9	78	6	8.57		.	.	.
SKOOTAMATTA LAKE	4450	7716	66	1263.9	80	1	6.99		8.64	.	.
STOCO LAKE	4428	7717	66	503.0	78	7	7.60		56.00	.	.
SYDENHAM LAKE	4425	7633	64	451.2	78	7	9.80		.	.	.
UPPER RIDEAU LAKE	4441	7620	61	1363.2	80	9	8.58		75.60	.	.
VARTY LAKE	4423	7649	64	600.2	78	6	8.49		78.00	.	.
WESLEMKOON LAKE	4502	7725	66	1956.9	80	1	6.91		8.24	.	.
WHITE LAKE	4518	7631	63	2358.2	80	6	8.28		108.30	.	.
WOLFE LAKE	4441	7630	64	955.0	80	8	8.01		89.60	.	.

REGION=CENTRAL

LAKENAME	LAT	LONG	DISTRICT	AREA (HA)	YEAR	MONTH	PH	RISK	ALK (MG/L)	AL (MG/L)	CA (MG/L)
GLOUCESTER POOL	4451	7942	71	1377.6	81	2	7.85		91.20	.	.
MACLEAN LAKE	4449	7939	71	97.7	81	2	6.08		8.90	.	.
SIX MILE LAKE	4454	7943	71	1474.4	81	2	7.85		90.60	.	.
TEA LAKE	4452	7939	71	129.7	81	2	6.69		18.10	.	.
WOODLAND LAKE	4454	7933	71	79.3	80	1	5.96	*	2.36	.	2.4